EUB

Upstream Petroleum Industry Flaring, Incinerating, and Venting

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1 Introduction

1.1 Purpose of This Guide

The Alberta Energy and Utilities Board (EUB) *Guide 60: Upstream Petroleum Industry Flaring, Incinerating, and Venting* provides regulatory requirements and guidelines for flaring, incinerating, and venting in Alberta, as well as procedural information for flare permit applications, dispersion modelling, and the measuring and reporting of flared, incinerated, and vented gas. In addition to upstream petroleum industry facilities, the guide also applies to gas transmission facilities licensed by the EUB.

This revised guide supersedes the previous edition of *Guide 60* (1999) and all editions of *Guide 60: Updates and Clarifications* (1999 and 2001). As a result, *Interim Directive (ID) 99-06*, which introduced *Guide 60* (1999), is also rescinded.

This guide incorporates new requirements for the evaluation of solution gas venting and the reporting of economic evaluation data on solution gas flares and vents as described in *General Bulletin (GB) 2002-05: EUB Requirements for Evaluation of Solution Gas Vent Gas Conservation.*

1.2 Flaring, Incinerating, and Venting Management Hierarchy and Framework

Flaring, incinerating, and venting are associated with a wide range of energy development activities and operations, including disposal of gas associated with

- oil, bitumen, and gas well drilling,
- oil, bitumen, and gas well completion or well servicing (well "cleanup"),
- gas well testing to estimate reserves and determine productivity,
- oil or bitumen production (solution gas),
- nonroutine maintenance or emergency depressuring of gas pipelines and processing plant facilities, and
- upstream petroleum industry waste management facilities.

Two multistakeholder teams from the Clean Air Strategic Alliance (CASA) have made recommendations on flaring, incinerating, and venting for the upstream petroleum industry upon which the EUB has based *Guide 60* (see Appendix 4 for background on *Guide 60*).

In particular, the EUB has adopted CASA's objective hierarchy and its framework for the management of routine solution gas flares (Figure 1) and has extended its application to include flaring, incinerating, and venting of gas in general (see also CASA's 1998 *Management of Routine Solution Gas Flaring in Alberta: Report and Recommendations of the Flaring Project Team*).

The objective hierarchy suggests that licensees ask the following three questions:

- Can flaring, incinerating, and venting be eliminated?
- Can flaring, incinerating, and venting be reduced?
- Will flaring, incinerating, and venting meet performance standards?

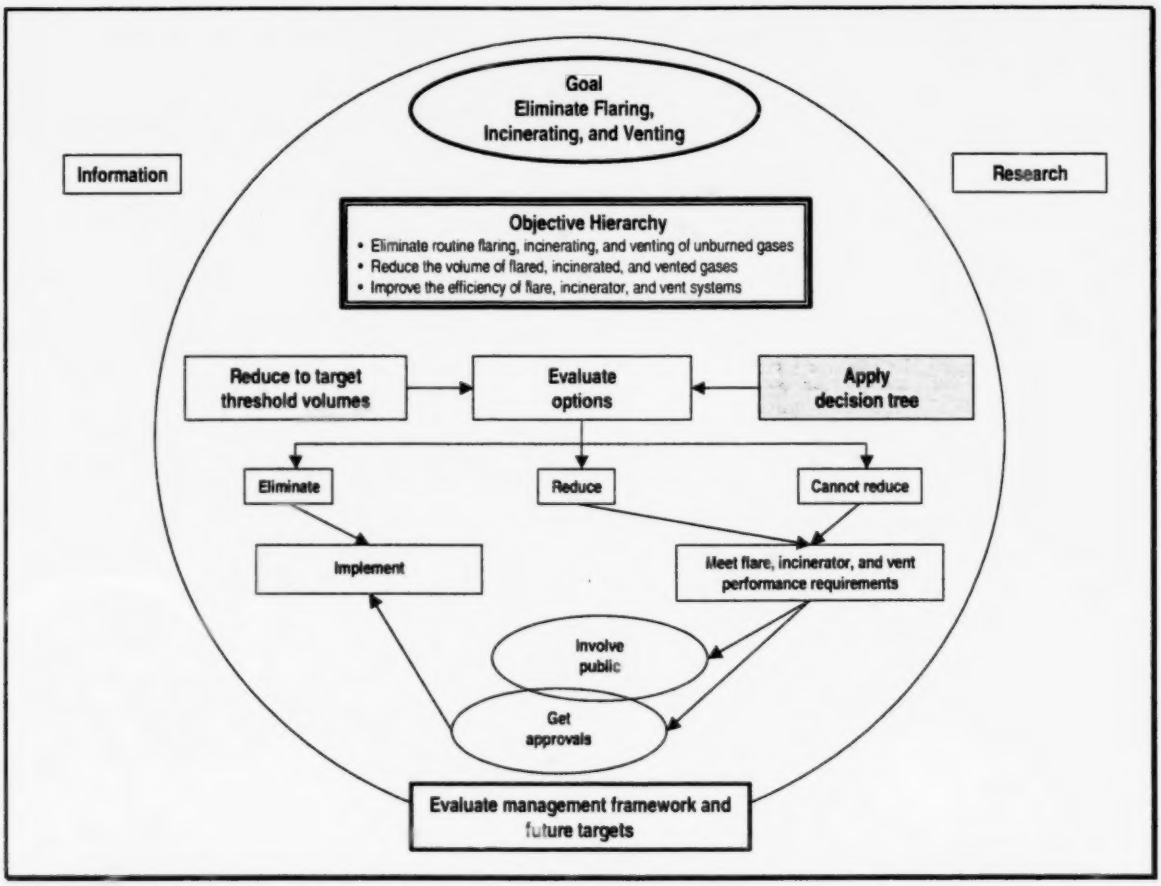


Figure 1. Solution Gas Flaring/Venting Management Framework (adapted from CASA)

1.3 Access to Production Flaring, Incinerating, and Venting Data

The EUB makes flaring, incinerating, and venting information available to licensees in order to facilitate solution gas conservation and clustering opportunities, as described in Section 2.12.

1.4 How to Use This Guide

EUB requirements and recommended practices are numbered sequentially within each section and subsection throughout *Guide 60*. In general, "must" indicates a requirement, and "recommends" and "expects" indicate a recommended practice.

To assist the reader, Appendix 1 lists references and contacts cited, Appendix 2 lists definitions of terms used, and Appendix 3 lists acronyms and abbreviations used throughout the text.

2 Solution Gas Management (Crude Oil/Bitumen Battery Flaring, Incinerating, and Venting)

The goal of the EUB is to have industry continue to reduce the volume of routine solution gas flared, incinerated, and vented. The EUB expects that the petroleum industry will pursue continuous improvement in reducing solution gas flaring and venting in Alberta. The EUB will monitor progress to determine the need for additional regulatory measures to facilitate increased solution gas conservation.

Combustion of solution gas in incinerators or other types of enclosed burners is not considered an alternative to conservation.

For the purposes of solution gas management and disposition reporting, incinerated gas is considered as flared.

Conservation is defined as the recovery of solution gas for use as fuel for production facilities, for other useful purposes (e.g., power generation), for sale, or for injection into an oil or gas pool. Conservation opportunities are evaluated as economic or uneconomic based on the assumptions and parameters listed in Section 2.7.

2.1 Solution Gas Flaring Reduction Targets

Significant reduction in flaring has been accomplished by the upstream petroleum industry. Relative to the 1996 baseline, solution gas flaring was reduced by 53% in 2001. Consistent with its goal, the EUB accepts the recommendation made by CASA in the 2002 *Gas Flaring and Venting in Alberta: Report and Recommendations for the Upstream Petroleum Industry by the Flaring/Venting Project Team* to ensure that reductions in flaring continue by setting out the following limits:

1) **The Alberta solution gas flaring limit is 670 million cubic metres (10^6 m^3) per year** (50% of the revised 1996 baseline of 1340 10^6 m^3/year) effective immediately.

2) If solution gas flaring exceeds the 670 10^6 m^3 limit in any year, the EUB will impose reductions that will stipulate maximum solution gas flaring limits for individual operating sites based on analysis of the most current annual data so as to reduce flaring to less than 670 10^6 m^3/year. For example, solution gas flaring could be limited to a maximum of 500 thousand (10^3) m^3/year at any one site.

2.2 Solution Gas Venting Reduction

The EUB is not establishing provincial solution gas vent reduction targets at this time; however, the CASA Flaring/Venting Project Team will reconvene in 2003 and consider making recommendations in this regard.

The EUB does not consider venting as an acceptable alternative to flaring. If gas volumes are sufficient to sustain stable combustion, the EUB requires that the gas be burned (see Section 8.1).

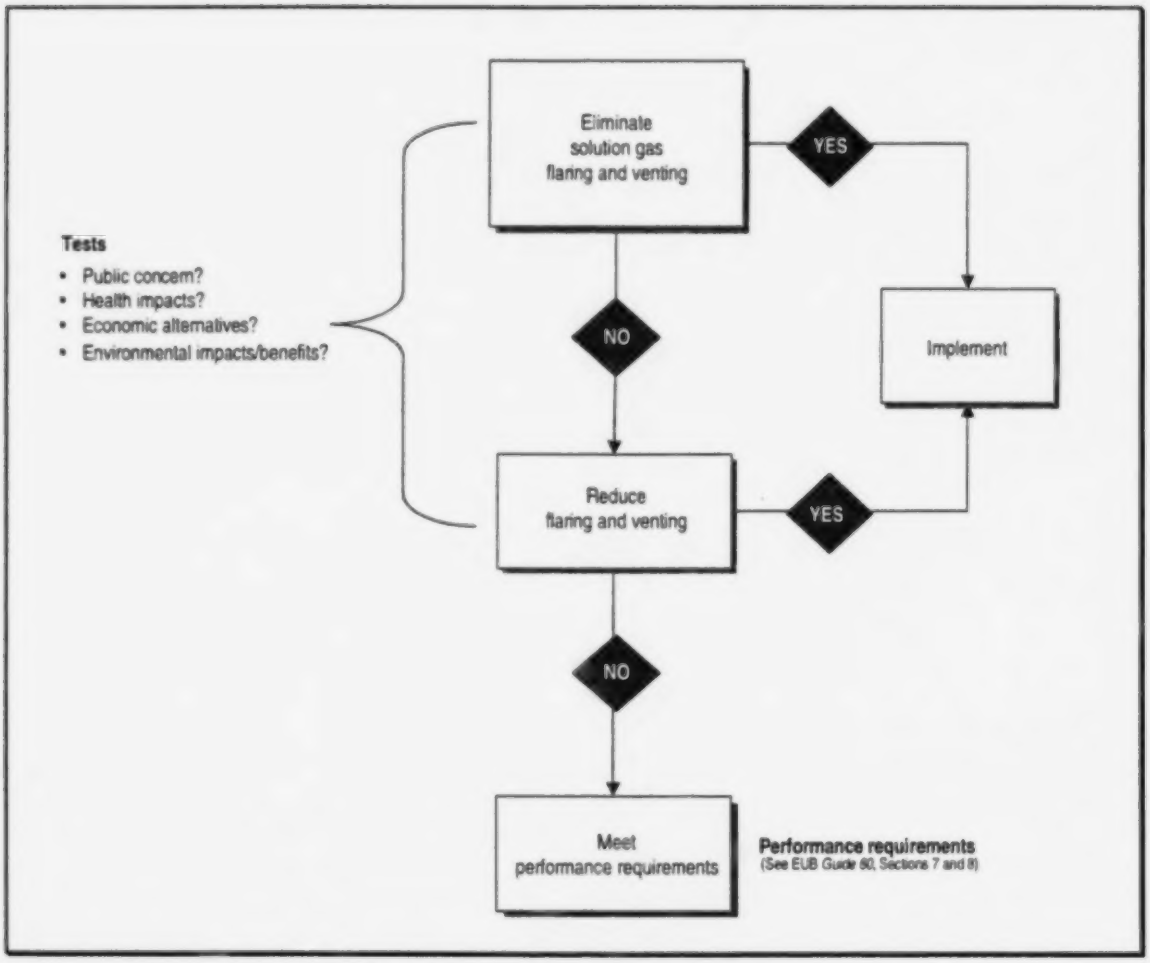


Figure 2. Solution Gas Flaring/Venting Decision Tree (adapted from CASA)

2.3 Solution Gas Flaring and Venting Decision Tree

The EUB adopted the Solution Gas Flaring/Venting Management Framework (Figure 1) and endorses the Solution Gas Flaring and Venting Decision Tree Process (Figure 2), as recommended by CASA.

2.4 Conservation at Oil and Bitumen Batteries

Unless otherwise stated, the requirements listed below are effective as of the date of this guide.

1) All proposed new flares and vents must be evaluated using the decision tree process.

2) Oil and bitumen wells producing with a gas:oil ratio (GOR) greater than 3000 m^3/m^3 at any time during the life of the well must be shut in unless the gas is conserved.

3) Licensees must obtain approval from the EUB Operations Group to discontinue conservation once it has been implemented.

   a) Licensees must complete a decision tree to evaluate alternatives to discontinuing conservation.

   b) The appropriate EUB Field Centre and residents within 500 m must be notified of intentions to discontinue conservation and initiate flaring or venting at a site.

   c) A 75% reduction in conservation may be acceptable until a decision tree analysis is completed.

2.4.1 Solution Gas Flares and Vents at New Oil/Bitumen Wells

The requirements listed below supersede all corresponding requirements as defined in *Guide 7: Production Accounting Handbook*.

1) During the New Oil Well Production Period (NOWPP), gas flaring is limited to a maximum of 300 10^3 m^3/month/well and is subject to the requirement listed below.

   a) If solution gas flaring or venting exceeds 300 10^3 m^3 in any month, wells must be shut in immediately and the NOWPP is terminated in the month following the exceedance.

2) Applicants must assess conservation opportunities for all new oil or bitumen wells using the process and criteria defined in Section 2.7 and must implement conservation if it is determined to be economic.

3) Licensees must implement economic conservation at new oil/bitumen wells within 3 kilometres (km) of a conserving facility within 30 days of initial production.

4) Licensees must implement economic conservation at new oil/bitumen wells farther than 3 km from a conserving facility within six months of initial production.

5) The EUB expects operators to make best efforts to implement economic conservation as soon as possible once sufficient reservoir data have been obtained (stabilized flow) and to shut in the wells. In some cases, sufficient data will have been obtained in 72 hours. If the decision tree analysis indicates that it is economic to conserve the solution gas, the EUB expects industry to consider leaving the oil wells shut in until they have been tied into a gas conserving facility.

6) Exceptions to meeting timelines for implementing economic conservation must have prior written approval from the EUB Operations Group. When requesting an exception to new oil/bitumen well conservation, licensees must include the reason for the request, a decision tree analysis, and an economic evaluation of the well.

2.4.2 Solution Gas Flares at Existing Oil/Bitumen Batteries

1) Solution gas flares that commenced operation prior to December 31, 2002, must be evaluated using the decision tree process (Section 2.7) by January 1, 2003.

2) If economic, conservation must occur within six months of the evaluation process.

2.4.3 Solution Gas Vents at Existing Oil/Bitumen Batteries

This section incorporates and supersedes requirements from *GB 2002-05*.

1) Licensees that report solution gas venting must evaluate conservation following the requirements described in Section 2.7 and must comply with the following schedule:

   a) All companies with fewer than 50 vent sources greater than 800 m^3/day[1] must comply as follows:

      i) By December 31, 2002, evaluate all vent sources greater than 800 m^3/d.

      ii) By December 31, 2003, implement conservation of all vent sources evaluated during 2002 and determined to be economic.

      iii) By December 31, 2003, evaluate all vent sources greater than 500 m^3/d.

      iv) By December 31, 2004, implement conservation of all vent sources evaluated during 2003 and determined to be economic.

   b) Companies with more than 50 vent sources greater than 800 m^3/d have the option to manage vent source evaluations based either on (a) above or on the total vented volumes by complying with the following:

      i) By December 31, 2002, evaluate 50% of reported vented volumes from all sources.

      ii) By December 31, 2003, implement conservation at all vent sources evaluated during 2002 and determined to be economic.

      iii) By December 31, 2003, evaluate 50% of the remaining vented volume from all sources that were not previously evaluated.

      iv) By December 31, 2004, implement conservation at all sources evaluated during 2003, determined to be economic, and where conservation was not previously implemented.

[1] The 800 m^3/d and 500 m^3/d criteria for determining sources that must be evaluated are to be based on the annual average daily vent rate calculated from EUB year-end data for 2001.

v) By December 31, 2004, evaluate all remaining vent sources greater than 500 m^3/d.

vi) By December 31, 2005, implement conservation for all remaining sources evaluated in 2004, determined to be economic, and where conservation was not previously implemented.

c) By December 31, 2002, companies that conduct vent source evaluations based on total vent volumes as stated in (b) above must be able to provide a plan upon EUB request that includes the following information:

i) a complete list of vent sources, including 2001 and subsequent year venting rates, locations, and reporting battery codes;

ii) a list of sources yet to be evaluated and a corresponding evaluation schedule; and

iii) a current summary of vent sources evaluated in each year.

2.4.4 Delays in Implementing Conservation

Licensees must implement conservation projects on a timely basis and meet the minimum requirements described in Sections 2.4, 2.4.1, 2.4.2, 2.4.3, and 2.7. The EUB expects licensees to be proactive in considering alternatives to minimize delays in conserving solution gas.

1) If the implementation of conservation will not meet the required timelines, the licensee must reduce solution gas production by 75% until conservation is implemented.

2) Should circumstances beyond a licensee's reasonable control (e.g., pipeline right-of-way access disputes) prevent meeting timelines for implementing conservation, the EUB Operations Group must be notified as soon as the issue becomes apparent and must be consulted on plans to address the situation.

2.5 Clustering

Solution gas is economic to conserve in some areas if competing licensees coordinate their efforts in an efficient, cooperative process to take advantage of combined gas volumes and economies of scale. Further, solution gas conservation economics will be enhanced if conservation is incorporated into the initial planning of larger multiwell projects.

1) Licensees of oil production facilities within 1 km of each other must cooperate in the evaluation and implementation of solution gas conservation projects.

a) Licensees are expected to exchange production data and jointly consider clustering of solution gas production or regional gas conservation systems.

2) Licensees of multiwell oil or bitumen developments must assess conservation on a project basis. Evaluations must address all potential gas vent and flare sources associated with the proposed project.

   a) The EUB expects licensees to incorporate provision for conservation at all stages of project development to optimize the opportunity for economic conservation of solution gas.

   b) Applications for multiwell oil or bitumen developments must include a summary of the gas conservation evaluation and a description of related project plans.

   c) Where conservation is not initially implemented, licensees must reassess gas conservation following project startup and once gas flaring, incinerating, and venting rates can be determined.

2.6 Power Generation Using Otherwise-Flared/Vented Gas

Power generation is an alternative for conserving solution gas, and microturbines are an emerging technology for using natural gas to generate electricity.

1) EUB approval of electrical power plants is required under the Hydro and Electric Energy Act.

   a) EUB *Guide 28: Applications for Power Plants, Substations, and Transmission Lines* provides a simplified application form for electric power generating projects smaller than 1.0 megawatt (MW).

2) Power generation facilities with a capacity greater than 1.0 MW require approval from Alberta Environment issued under the Environmental Protection and Enhancement Act.

2.7 Economic Evaluation of Gas Conservation

1) **Gas must be conserved if conservation is determined to be economic.**

2.7.1 Economic Evaluation Assumptions and Parameters

Economic evaluations of gas conservation must use the following assumptions and parameters.

1) Evaluations must be completed on a before-tax basis.

2) Price forecasts used in the evaluation of conventional gas conservation projects (gas gathered, processed, and sold to market) must use the most recent Chenery-Dobson Resource Management Ltd. *Survey of Hydrocarbon Price Forecasts Utilized by Canadian Petroleum Consultants and Canadian Banks*. (This publication is available at a nominal cost and is also available at the EUB library.)

3) Price forecasts for power generation projects must reflect the most recent *Electricity Price Forecast for the Alberta Integrated Electric System* published by the Canadian Energy Research Institute (CERI) or the cost of the power displaced at the site. If a forecast is required beyond the term of CERI's forecast, the power price should be escalated at the annual rate of inflation. The forecast is available at a nominal cost from the CERI Web site at <http://www.ceri.ca/> and is also available in the EUB library.

4) Licensees must have information to support the remaining reserves calculation and the production forecast (including planned drilling programs and pressure maintenance schemes) and provide this information to the EUB upon request.

5) Licensees must have a detailed breakdown of capital costs showing equipment, material, installation, and engineering costs and provide this information to the EUB upon request. Capital costs are approved-for-expenditure quality numbers and must be based on selection of appropriate technology. Any capital costs incurred prior to the initiation of the solution gas project (sunk costs) must not be included in the analysis; only future capital costs related to solution gas conservation may be included.

6) The incremental annual operating costs for the gas conservation project, including gas gathering and processing fees, are to be assumed as equal to 10% of the initial capital cost of installing the conservation facilities. If the gas contains 10 moles per kilomole (mol/kmol) hydrogen sulphide (H_2S) or more, the incremental annual operating costs for the solution gas project may be assumed to be equal to 20% of the capital cost to initially install the conservation facilities.

   a) The economic evaluation must account for any cost savings, such as reduced trucking, equipment rental, and licensee costs, that may result from the conservation project.

7) The incremental annual operating costs for power generation projects are to be assumed as equal to 10% of the initial capital cost of installing the generation facilities. Standby fees may be calculated in addition to this 10% allowance.

8) The long-term inflation rate must be based on the Consumer Price Index forecast.

9) The discount rate must be equal to the prime lending rate of Alberta Treasury Branches on loans payable in Canadian dollars plus 3%, based on the month preceding the month during which the evaluation is conducted. This rate is reviewed periodically by the EUB and will be revised if the cost of capital for the oil and gas industry changes significantly.

10) Only revenue minus net royalties from incremental gas and gas by-products that would otherwise be flared or vented is included in the economic evaluation.

11) A project is considered economic if the incremental economics of gas conservation generates a net present value before tax greater than zero.

2.7.2 Economic Evaluation Data

If a licensee determines that gas conservation is uneconomic, the complete decision tree analysis and economic evaluation must be available for audit.

1) The EUB may request licensees to provide additional information to demonstrate that all practical options for gas conservation have been thoroughly evaluated.

2) The EUB may request a re-evaluation if it appears that cost estimates are excessive or based on inappropriate technology.

2.8 Consultation and Notification

Licensees with continuous solution gas flares must consult and/or notify the public of activities related to the flaring, incinerating, and venting of solution gas at upstream petroleum industry facilities. Consultation requirements for flares also apply in situations where incinerators or enclosed burner technologies are used to dispose of waste solution gas.

Public consultation and notification requirements for new facility applications are specified in *Guide 56: Energy Development Application Guide*.

1) Applicants for new wells and facilities are required to include information specific to flaring, incinerating, and venting as part of the public notification process (see Section 2.8.1).

2) Residents within 500 m of a facility's solution gas flare or vent must be notified by the licensee of the results of the decision tree evaluation.

   a) An information package specific to flaring, incinerating, and venting, including the material listed in Section 2.8.1, is required as part of public notification.

3) Licensees must notify the public, the EUB Field Centre, and Alberta Environment of nonroutine flaring, incinerating, and venting at production and processing facilities, as described in Section 2.10, Table 1.

2.8.1 Public Information Package

A licensee may use the Canadian Association of Petroleum Producers (CAPP) publication *Best Management Practice: Flaring of Associated and Solution Gas* as a template for putting together public information packages or may develop its own publication information package, which **must include the following:**

1) the definition of solution gas and information on its conservation and use;

2) an explanation of solution gas flaring, incinerating, and venting management options and the decision tree process;

3) results of the decision tree analyses for the site in question;

4) information on general flare/vent performance requirements and reduction targets;

5) a description of specific actions the licensee will take to eliminate, reduce, or improve the efficiency of the flare, incinerator, or vent source based on the evaluation;

6) a description of the EUB process for facility applications and approvals (see *Guide 56*);

7) information about an individual's right to object and the process for doing so; and

8) a list of industry, EUB, and government contacts related to public consultation.

2.9 Dealing with Public Concerns/Objections

1) Licensees must address public concerns/objections about solution gas flaring, incinerating, and venting that arise from notification (Section 2.8).

   a) Licensees and the public must comply with requirements and guidelines described in Section 3.8.2 for addressing unresolved concerns and objections to solution gas flaring, incinerating, or venting.

2.10 Flaring, Incinerating, and Venting at Conserving Facilities

The EUB requires licensees to minimize flaring, incinerating, and venting during upsets and outages of conserving facilities.

The EUB notes that in certain areas of Alberta local emission reduction practices already meet or exceed those detailed below. In these cases, the EUB expects that current practices will continue to prevail. Operators are expected to consult with the appropriate EUB Field Centre on local practices for minimizing solution gas flaring during conserving facility outages.

2.10.1 Limitations on Nonroutine Flaring, Incinerating, and Venting During Conserving Facility Outages

Repeat nonroutine solution gas flaring, incinerating, and venting occur as a result of multiple emergency, upset, or unplanned maintenance outages.

For the purpose of this section, repeat nonroutine flaring, incinerating, and venting are a series of events at conserving production batteries or processing plants during a 30-day period.

1) Production operations must be managed to control nonroutine flaring, incinerating, and venting of normally conserved solution gas in accordance with Table 1.

2) Licensees must notify the appropriate EUB Field Centre regarding nonroutine flaring, incinerating, or venting within 10 days of a complaint.

Table 1. Limitations on nonroutine flaring, incinerating, and venting during conserving facility outages

Shutdown category	Duration (hours)	Operational requirements
Planned	< 4	Licensees must make all reasonable efforts[1] to reduce battery or solution gas plant inlet gas volumes by 50% of average daily production over the preceding 30-day period.
	> 4	Licensees must reduce battery or solution gas plant inlet gas volumes by 75% of average daily production over the preceding 30-day period and meet the following requirements: • Solution gas must not be flared from wells that have an H_2S content greater than 10%. • Production may be sustained at rates to provide sufficient throughput to keep equipment operating safely and within minimum design turndown range. If this volume is greater than 25% of the average daily production, a variance must be obtained from the EUB (see Section 2.10.3). • Residents within 500 m, interested individuals, and people sensitive to emissions at the facility must be notified at least 24 hours before the planned flaring event. • The appropriate EUB Field Centre must be notified if the event meets reporting requirements identified in *IL 98-01*,[2] Section 4.4.
Emergency[3] or plant upset	< 4	No reduction in plant inlet is required.
	> 4	Licensees must reduce battery or solution gas plant inlet gas volumes by 75% of average daily production over the preceding 30-day period and must meet the following requirements: • Solution gas must not be flared from wells that have an H_2S content greater than 10%. • Production may be sustained at rates to provide sufficient throughput to keep equipment operating safely and within minimum design turndown range. If this volume is greater than 25% of the average daily production, a variance must be obtained from the EUB (see Section 2.10.3).[3] • Residents within 500 m and people sensitive to flaring at the facility must be notified as soon as practical about the flaring event. • Interested public other than the above must be notified within 24 hours of the flaring event. • The appropriate EUB Field Centre must be notified if the event meets reporting requirements identified in *IL 98-01*, Section 4.4.
Repeat nonroutine flaring[4]		Licensees must investigate causes of repeat nonroutine flaring or venting and take steps necessary to eliminate or reduce the frequency of such incidents.

[1] Notwithstanding solution gas reduction requirements listed in Table 1, if a sour or acid gas flare or incinerator stack is not designed to meet the one-hour Alberta Ambient Air Quality Guidelines for sulphur dioxide (SO_2) under high flow rate conditions, action must be taken immediately to reduce gas to a rate compatible with Alberta Ambient Air Quality Guidelines compliance (see Section 7.6).

[2] *IL 98-01: A Memorandum of Understanding Between Alberta Environmental Protection and the Alberta Energy and Utilities Board Regarding Coordination of Release Notification Requirements and Subsequent Regulatory Response.*

[3] Emergency shutdowns or plant upsets are unplanned events at the battery site or at facilities downstream of the battery that cause nonroutine flaring at the battery.

[4] Repeat nonroutine flares are defined as recurring events of similar cause at a conserving facility during a 30-day period.

2.10.2 Planned Shutdown (Turnaround) Considerations

1) Licensees must evaluate and implement appropriate alternatives to reduce solution gas flaring, incinerating, and venting during a gas plant turnaround. Alternatives that minimize impacts of planned shutdowns include

   a) delivering solution gas to a nearby gas plant that is not on turnaround;

b) scheduling maintenance at related oil facilities to coincide with the gas plant turnaround;

c) injecting solution gas into the gas cap of an oil pool or into a gas reservoir and producing it back when the gas plant is back on stream (see *Guide 65: Resources Applications for Conventional Oil and Gas Reservoirs*); and

d) communicating with well, battery, and gas plant licensees to ensure that nonroutine solution gas flaring, incinerating, and venting are minimized.

2.10.3 Variance to Solution Gas Shut-in Requirements

The EUB will consider alternatives to the operational requirements listed in Table 1 if the licensee can demonstrate that shutting in a well or a group of wells may cause permanent damage to well equipment or a significant reduction in productivity, or if shutting in is impractical due to the remoteness of facilities. In these special cases, the licensee must consult with the EUB Field Centre to establish new guidelines for a particular gas plant or battery.

1) Licensees must anticipate unplanned outages and, if a variance from Table 1 is justified, contact the EUB Field Centre regarding appropriate guidelines for the shutting in of solution gas. Contact with the EUB Field Centre must not be deferred until an actual outage occurs.

2) Licensees must submit a written request to the EUB Field Centre explaining the variance requested and giving supporting reasons for the request a minimum of 30 days prior to a planned shutdown.

2.11 Royalty Treatment of Flared and Vented Gas

In December 1998 the Alberta Government created the Otherwise Flared Solution Gas Royalty Waiver Program to encourage the productive use of solution gas currently being flared. For more information, see the Alberta Energy *Information Letter (IL) 99-19: Otherwise Flared Solution Gas Royalty Waiver Program* available on line at <www.energy.gov.ab.ca>.

The program is summarized as follows:

- Regulatory changes have been made to provide a royalty waiver on solution gas currently being flared because it is uneconomic to conserve the gas.
- The program covers all methods of conserving solution gas.
- The Alberta Department of Energy has developed criteria to ensure that when gas can be economically conserved, it does not receive a royalty waiver.

2.12 Solution Gas Reporting Requirements and Data Access

2.12.1 Solution Gas Reporting Requirements

1) All flared and vented solution gas must be reported monthly through the Petroleum Registry of Alberta (see *ID 2002-01: Electronic Submission of Production,*

Disposition, and Transportation Volumetric Information and Well Status Changes) and as described in Section 10.

a) Licensees must obtain a battery code for any new oil wells before production, including flaring, can be reported.

2) In some cases where low volumes of gas are being produced and flared, incinerated, or vented, the licensee may be exempt from measuring gas production (see *Guide 7* and Section 10.2).

a) Exempted licensees must provide accurate estimates of gas production and disposition, including flared, incinerated, and vented gas, in such situations.

2.12.2 Data Access

The EUB makes available production data related to the disposition of oil, gas, and water for all crude oil and bitumen batteries, except information associated with experimental wells. Confidential information is respected using existing confidentiality protocols.

Electronic copies of the data identified as *Statistical Series (ST)-60* and *ST-60A* are available on a monthly and annual basis. Data are provided for oil batteries and bitumen batteries.

There is a fee for the data, based on cost recovery for the EUB. It is the responsibility of the interested party to sort the data according to its own needs. It is also the responsibility of the interested party to determine if the data represent a physical battery or a collection of single wells that are reported on a common report (i.e., a "paper" battery).

2.12.3 Third-Party Access to Data

Third-party organizations may identify economic alternatives to flaring or venting if the availability of flared or vented solution gas is made known publicly. The EUB expects licensees to cooperate with qualified third parties attempting to conserve solution gas through open market or clustering efforts by providing nonconfidential information, such as gas analyses, flared and vented volumes, pressures, and other relevant data, on a timely basis (also see Section 2.5).

However, the EUB expects that any party making data requests to licensees is technically qualified and has a reasonable expectation of proceeding with the gas conservation project. Third parties must also comply with all relevant EUB ownership, environmental, and safety regulations, as well as applicable technical standards and codes.

3 Temporary and Well Test Flaring and Incinerating

This section applies to the assessment and permitting of flaring and incinerating activities where temporary flare stacks and incinerators are used. These activities include but are not limited to well testing, well cleanup, well servicing, sour gas pipeline blowdown, coalbed methane testing, and underbalanced drilling.

The EUB does not consider venting as an acceptable alternative to flaring. If gas volumes are sufficient to sustain stable combustion, the EUB requires that the gas be burned (see Section 8.6 for specifics on well test venting).

3.1 Gas Well Test Flaring and Incinerating Decision Tree

1) Licensees must use the Well Test Flaring and Incinerating Decision Tree Process (Figure 3) to evaluate opportunities to eliminate or reduce flaring and incinerating.

2) Licensees must evaluate opportunities to connect wells to existing gas gathering systems prior to commencing well cleanup and testing operations (i.e., "in-line testing"). The EUB expects that in-line testing will be conducted when practical do so, such as in situations where

   a) suitable infrastructure exists in proximity to the well and can be connected at moderate cost, or

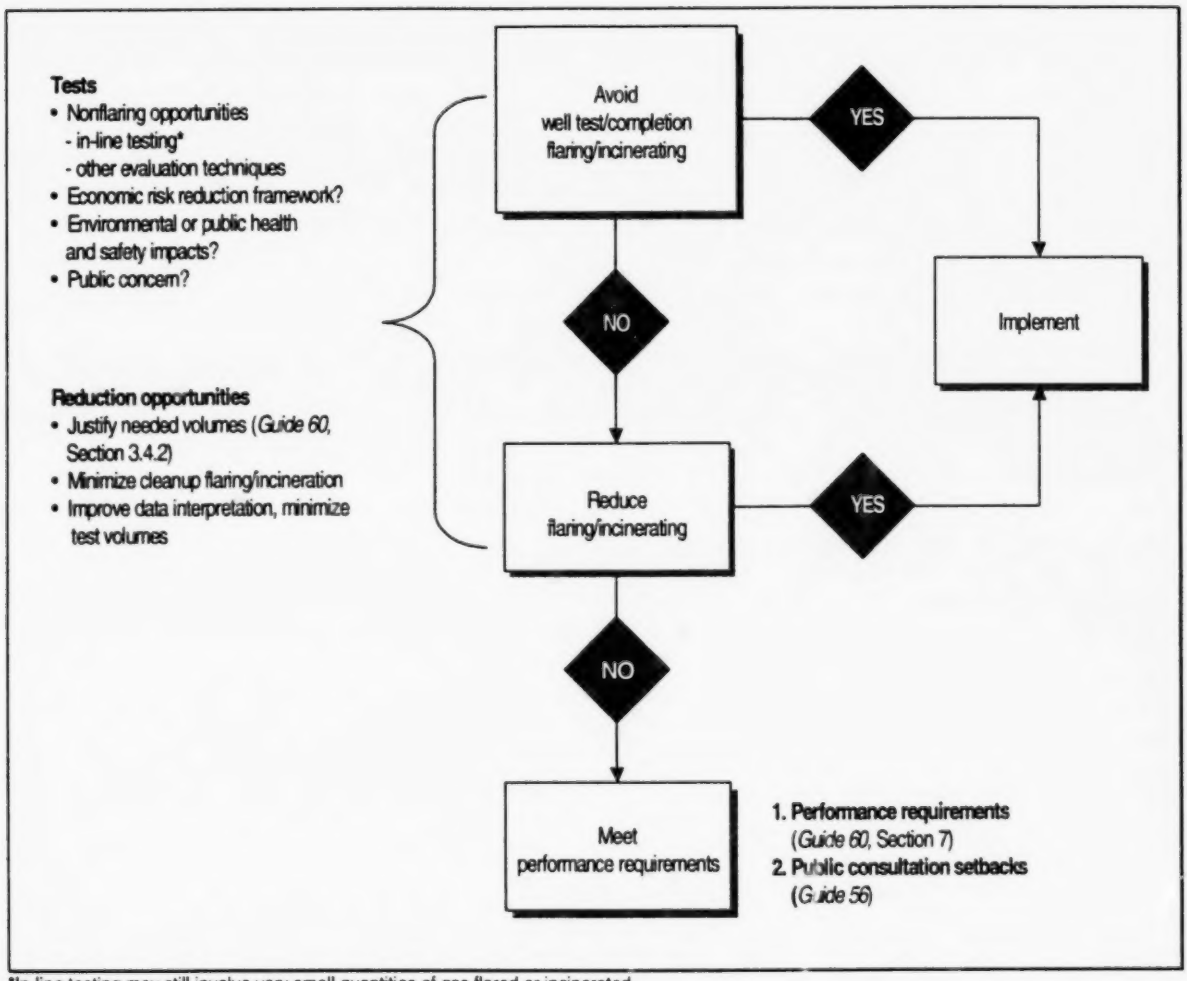
   b) sufficient productivity information is known about a development well such that connecting pipelines can be constructed with minimal financial risk prior to testing.

3) If in-line testing is not possible, licensees must design completions and well testing programs to minimize emissions, while ensuring a technically sound well completion and acquisition of sufficient reservoir and productivity information for future development decisions. *Guide 40: Pressure and Deliverability Testing Oil and Gas Wells* should be consulted for details on the minimum pressure and deliverability requirements for well testing and the recommended practices to ensure that the appropriate information is obtained for conservation and pool management purposes in addition to the requirements of this guide.

   a) Licensees must use equipment and design well completion and test programs to comply with performance requirements in Section 7 and the Alberta Ambient Air Quality Guidelines.

3.2 Temporary Flaring/Incinerating Permits

1) Licensees must apply for a permit to use temporary flares or incinerators to dispose of sour gas containing more than 50 mol/kmol (5%) H_2S or large volumes of natural gas during drilling (including underbalanced drilling), completion or recompletion, cleanup and testing operations, and blowdowns of sour gas pipelines. These requirements also apply to all upstream petroleum industry activities, including coalbed methane development.



*In-line testing may still involve very small quantities of gas flared or incinerated.

Figure 3. Well Test Flaring and Incinerating Decision Tree (adapted from CASA)

2) A representative of the EUB may suspend well flaring or incineration operations for noncompliance with conditions of the permit (see Section 12).

3.2.1 Conditions That Require a Temporary Flaring/Incinerating Permit

1) Licensees must obtain a permit to flare or incinerate sour gas containing more than 50 mol/kmol H_2S (5%) or sour gas from any well classified as a critical sour well.

2) Licensees must obtain a permit to flare or incinerate natural gas volumes exceeding the routine flare volume allowance during well drilling, completions, cleanup, and testing operations, regardless of H_2S content.

   a) The routine flare volume allowance is defined in three tiers:

i) **Tier 1 ≤ 600 10^3 m^3**: applies to wells that have not been tied in and have a Lahee classification of New Field Wildcat (NFW), New Pool Wildcat (NPW), Deeper Pool Test (DPT), or Outpost (OUT).

ii) **Tier 2 ≤ 400 10^3 m^3**: applies to wells that have not been tied in and have been assigned a Lahee classification (including Development) not listed in the Tier 1 allowance (excluding Re-entry [REN] and Experimental [EX] wells).

iii) **Tier 3 ≤ 200 10^3 m^3**: applies to any well that has been tied in to facilities appropriately designed to handle production from the formation being tested (e.g., sweet versus sour service).

b) The routine flare volume allowance for a re-entry well is the same tier allowance (1, 2, or 3) that applied to the well before it was reclassified as re-entry.

c) For wells with a Lahee classification of Experimental, the routine flare volume allowance is the same tier allowance (1, 2, or 3) that applied to the well before it was reclassified as Experimental or that normally would have applied to the well had it not been classified as Experimental.

d) An incremental volume of 200 10^3 m^3 may be added to the routine flare volume allowances defined above for each additional zone being tested during continuous operations on a well (with continuous operations meaning that servicing equipment and manpower are not demobilized between tests on each zone) subject to the following limitations:

i) The volume flared from any zone during multiple-zone tests must not exceed the routine flare volume allowance for a single zone unless a larger volume is specifically approved by the EUB.

ii) The incremental allowance does not apply to single tests over multiple commingled zones. Each zone to be tested must be identified and fully accounted for in the related flare permit application.

3.2.2 Conditions That Do Not Require a Temporary Flaring/Incinerating Permit

1) A permit is not required if the total volume is less than the routine flare volume allowance and if the gas contains less than 50 mol/kmol H_2S (5%). However, licensees must meet the flaring requirements set out in Section 3.5 and Section 7, as well as the notification and consultation requirements set out in Section 3.8.

a) Licensees are required to evaluate compliance with the one-hour Alberta Ambient Air Quality Guidelines for SO_2 if the gas contains more than 10 mol/kmol H_2S (1%). Related dispersion modelling results must be provided to the EUB upon request.

2) Flaring or incinerating small volumes of sour gas containing more than 50 mol/kmol H_2S (5%) are exempt from formal EUB approval requirements provided the following conditions are met:

   a) Total sulphur emissions do not exceed 1.0 tonne per day.

   b) Total flared or incinerated volumes do not exceed 10 10^3 m^3/d or a total of 50 10^3 m^3 over the duration of the event.

   c) Equipment is designed to ensure compliance with the one-hour Alberta Ambient Air Quality Guidelines for SO_2 and/or operating procedures are in place to ensure compliance with the guideline. Related dispersion modelling evaluations and design information is documented and available to the EUB upon request.

   d) Flared or incinerated volumes are measured and reported as defined in Section 10.

   e) Written notification is provided to the EUB Operations Group. The notification includes the total expected gas volumes and sulphur emissions. If applicable, the notification provides an explanation of any air quality management plans needed to ensure compliance with the Alberta Ambient Air Quality Guidelines.

3) The EUB does not require flare permits for the use of permanent flares or incinerators installed in EUB-licensed facilities, including batteries, compressor stations, and gas plants, for well cleanup or testing operations, provided that total volumes are less than the routine flare volume allowance. Licensees must be able to verify, on request of EUB staff, that the flares or incinerators are designed to operate safely under the intended conditions in compliance with the Alberta Ambient Air Quality Guidelines.

4) Similarly, the EUB does not require flare permits for temporary flares or incinerators installed solely for emergency purposes. Licensees must ensure that temporary emergency systems are adequately designed to operate safely under anticipated emergency conditions and must meet the requirements set out in Section 7.6.

3.3 Flaring and Incinerating During Underbalanced Drilling

Permit requirements (Section 3.2) and notification and consultation requirements (Section 3.8) for well test flaring and incinerating also apply to underbalanced drilling.

For more detail on underbalanced drilling requirements, see *ID 94-03: Underbalanced Drilling* and *ID 97-06: Sour Well Licensing and Drilling Requirements*.

3.4 Permit Application Requirements for Temporary Flares and Incinerators

Permit applications to flare or incinerate gas volumes in excess of the routine flare volume allowance or volumes of sour gas in any amount must be submitted to the EUB Operations Group.

Figure 4 summarizes flare permit requirements for gas volumes exceeding the routine flare volume allowance or any volume of sour gas.

3.4.1 General Permit Application Requirements

1) Applications for flaring/incinerating permits must include complete information on the proposed activity, as summarized in the following items:

   a) information about the site where flaring/incinerating will occur, including location, Lahee classification, and related maps;

   b) information on planned flaring/incinerating, including reasons for the activity (e.g., well testing, completions, pipeline depressuring), H_2S content, flow rates, total volumes, and type of combustion device to be used (i.e., flare or incinerator);

   c) information on the applicant's assessment of impacts on ambient air quality, including results of dispersion modelling for SO_2;

   d) in situations where there is potential to exceed the one-hour Alberta Ambient Air Quality Guidelines for SO_2, information on the applicant's proposed management program to prevent exceedances;

   e) an application cover letter informing the EUB of any public objections and/or concerns to the proposed flaring/incineration activities; and

   f) a summary information form (see Appendix 6).

Permit application information requirements are detailed in Appendix 5.

3.4.2 Applications to Exceed the Routine Flare Volume Allowance

Information requirements apply to all applications to exceed the routine flare volume allowance.

1) Licensees must provide specific engineering, economic, and operational information to justify reasons for flaring or incinerating gas volumes in excess of the routine flare allowance.

2) All applications to flare or incinerate gas volumes greater than the routine flare volume allowance for either sour or sweet well tests must be submitted to the EUB Operations Group and must include the following, in addition to information

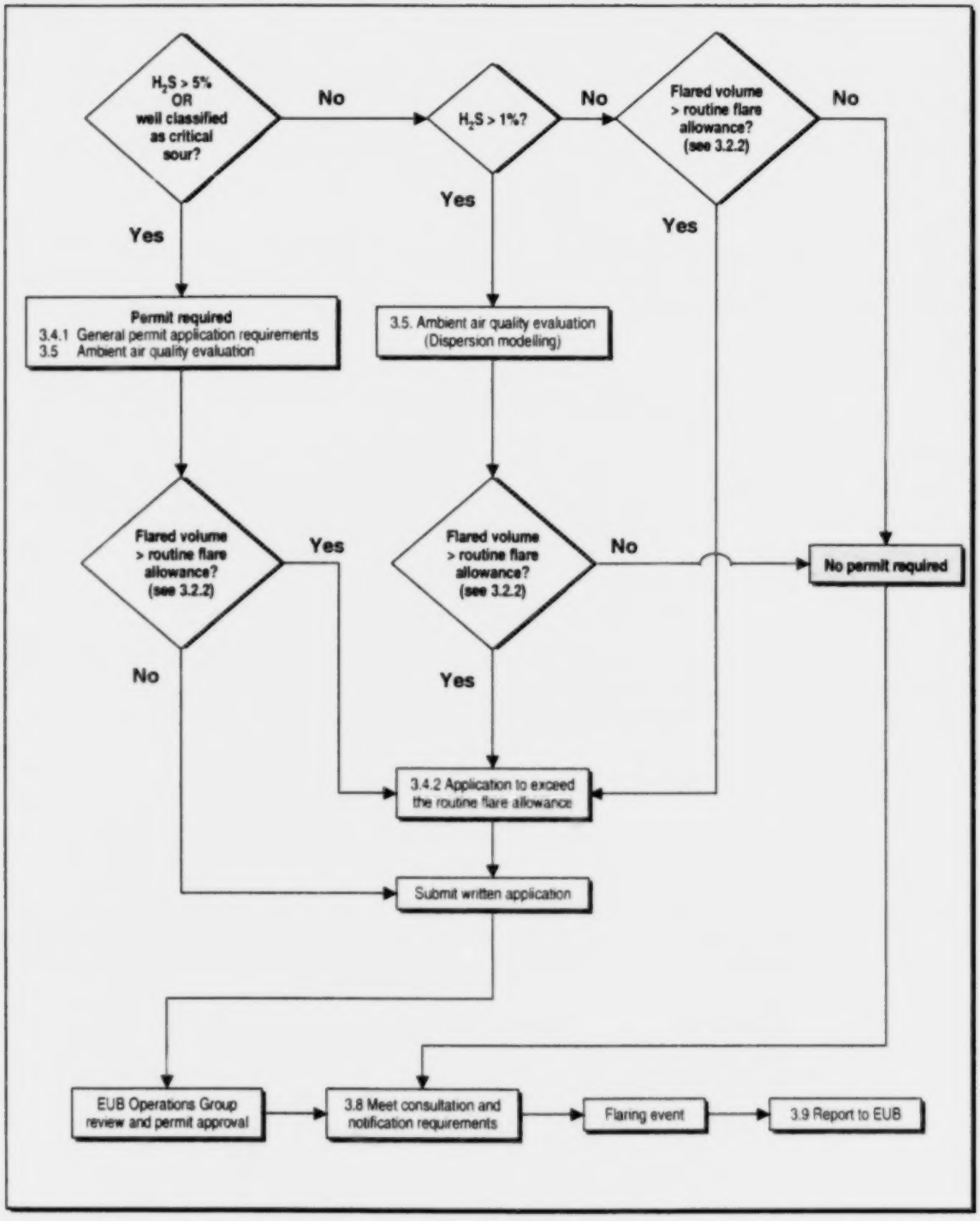


Figure 4. Temporary Flaring/Incinerating Permit Application Process

defined in Section 3.4.1 (note that items [c] and [d] of that section do not apply to sweet gas wells).

a) Applications relating to tests to determine if sufficient gas supply exists to justify related investments must include information on the scope of development required to produce the well and necessary threshold reserves. Details on required information in this regard are provided in Appendix 7.

b) Applications relating to tests to determine the relationship between Absolute Open Flow (AOF) and deliverability of the well must include justification of the volume being requested as it pertains to obtaining an accurate deliverability relationship as per EUB *Guide 40*.

c) Applications relating to tests to establish the stabilized flow rate of the well must include justification of the flare volume request as it pertains to obtaining a stabilized flow rate, including the identification of any analogous well(s) being used for comparison purposes.

2) Should the information described above not be available or applicable, applicants must include discussion on why the material is not included with the exceedance application.

3) For underbalanced drilling, follow the guidelines in Appendix 7.

3.4.3 Blanket Flaring/Incinerating Permits

Sour oil and gas well operations such as well servicing may result in flaring of relatively small volumes of gas at several sites in a local area. In order to simplify flare permit application requirements, the EUB Operations Group may issue a single "blanket" permit to cover several flaring events at different sites in an area if so requested by the licensee. Blanket permit application requirements and limitations are as follows:

1) Blanket permits are issued on a fixed-term basis for periods not to exceed one calendar year. Licensees must complete and submit a new flare permit application to renew blanket permits for additional periods of time.

2) Blanket permits are limited to specific stack heights, locations, rates, maximum volumes per event, maximum H_2S concentrations, and maximum sulphur emissions per event as listed in the permit application.

3) All wells must be licensed before they can be considered for a blanket permit.

4) For every well under consideration for a blanket application, licensees must use the EUB spreadsheet WellTest Ver 1.xls (available on the EUB Web site) to evaluate the well test parameters during the period when flaring/incinerating is planned.

   a) If the results fail to meet low-risk criteria for parallel terrain, then refined modelling may be considered and those results must meet low-risk criteria.

b) Any inconsistencies in the modelling will result in the application being rejected and returned to the applicant.

5) A blanket permit will not be considered if

a) projected volumes are over 100 10^3 m^3 per site or flaring event;

b) total sulphur emissions will exceed 10 tonnes per event;

c) a management plan is necessary for compliance with the Alberta Ambient Air Quality Guidelines;

d) complex terrain modelling is required for specific locations; or

e) exceptions may be made only after consultation with the EUB Operations Group.

6) A lists of wells, their bottomhole and surface locations, and licence numbers must be submitted to the EUB Operations Group before a blanket permit application will be considered.

7) A Sour Gas Flaring Data Summary Report (Appendix 12) for each flared well must be completed and submitted on April 1, July 1, October 1, and January 1 for the previous calendar quarter-year to the EUB Compliance and Operations Branch.

a) If no flaring was conducted over the previous calendar quarter-year, then a Sour Gas Flaring Summary Report must be submitted reflecting the lack of flaring.

8) Licensees must comply with public and EUB notification requirements for each flare event covered by the blanket permit as described in Section 3.8.

3.4.4 EUB Review of Permit Applications

Requested volumes, rates, and/or conditions may be modified by the EUB having regard for total volumes, total sulphur emissions, local land uses, proximity of residences, and potential for exceedance of the Alberta Ambient Air Quality Guidelines. EUB staff will consult with applicants in such situations.

1) The EUB expects licensees to avoid flaring or incinerating sour gas for well completion or testing in situations where existing infrastructure can be reasonably used for in-line disposition of the gas, especially in populated areas.

2) The EUB expects licensees to limit requested volumes for gas, especially gas with high H_2S contents. Situations involving sulphur emissions of 50 tonnes or more are subject to closer EUB scrutiny. The EUB typically will not approve permits where total sulphur emissions exceed 300 tonnes.

3.5 Ambient Air Quality Evaluation (Dispersion Modelling)

1) Licensees must evaluate impacts of sour gas flaring or incinerating on ambient air quality if it is proposed to flare or incinerate sour gas containing more than

   a) 10 mol/kmol H_2S, or

   b) 1 tonne per day of sulphur.

2) Information on ambient air quality impact evaluations must be included in applications to flare or incinerate sour gas or, if no permit is required, must be provided to the EUB upon request.

3) Sour gas flares and incinerators must be designed for the gas composition and flow rates for the specific situation involved in the flare permit.

4) Equipment design and/or operating procedures must address all modelled predictions that exceed the Alberta Ambient Air Quality Guidelines, excluding predicted values meeting the EUB's low-risk criteria. The low-risk criteria only apply to short-duration events and temporary flare and incineration equipment.

   a) EUB low-risk criteria for temporary flares and incinerators allow limited exclusion of predicted ambient air quality results, provided that

      i) the meteorological conditions that cause predicted exceedances occur less than 1% of the time, and

      ii) the values do not exceed a predicted one-hour SO_2 ambient air quality of 900 micrograms (µg) per m^3.

   b) EUB low-risk criteria are incorporated in the Temporary Flaring Spreadsheet (WellTest Ver 1.xls).

   c) EUB low-risk criteria may be used when refined and complex terrain modelling is conducted.

   d) The EUB will also consider licensee use of the low-risk criteria in situations where air quality management plans (see Section 3.5.2) are necessary to ensure compliance with the Alberta Ambient Air Quality Guidelines.

      i) Management plan decision criteria must be based on meteorological data.

5) Licensees must evaluate cumulative effects on ambient air quality where sour gas well flaring/incineration is proposed within 7 km of continuous SO_2 emissions sources, such as at sour gas plants. Sour gas flaring or incinerating operations must be planned so that Alberta Ambient Air Quality Guidelines exceedances due to the **combined** effect of all sources in the area do not occur.

6) The EUB will condition sour gas flaring or incinerating permits within a common 14 km radius to prevent concurrent sour gas well flaring/incinerating.

7) Dispersion modelling assessments must be done using methodologies acceptable to the EUB as described in Section 7.15, Appendix 8, and Appendix 9.

8) Licensees must retain information on dispersion assessments for flares that require dispersion modelling but do not require a flaring permit (see Section 3.2.2). This information must be provided to the EUB upon request.

3.5.1 Well Test Incinerator Modelling Requirements

Incinerators differ from flares in final exit velocity, radiation losses, possible downwash, and other significant characteristics.

1) The simplified methodology for sour gas flare evaluations must not be used to estimate ambient air quality impacts for incinerators.

2) Incinerators must be modelled on a case-by-case basis by personnel familiar with these unique characteristics and their impacts on dispersion modelling.

3) Licensees must support assumptions on incinerator stack exit velocity and temperature with related energy balance calculations and description of air-fuel controls.

4) Enclosed burner devices where air-fuel ratios are not controlled and/or where uncontrolled supplemental air is entrained in stack gases must use worst-case air dilution for dispersion calculations. Details of related calculations and related rationale must be provided to the EUB upon request.

5) Operators must use dispersion modelling methods described either in Appendix 9 or Section 7.15 for evaluation of sour well test incinerators.

6) Sour gas incinerators and enclosed burners must be operated to ensure that minimum stack exit temperature and velocity conditions (as identified in the dispersion modelling evaluations) are maintained.

3.5.2 Well Test Air Quality Management Plans

Information on requirements for management plans is provided in Appendix 10.

1) If it is not feasible to design the equipment for Alberta Ambient Air Quality Guidelines compliance under all conditions, licensees must develop and include in the permit application operating procedures that will prevent exceedances of the guidelines.

3.6 Site-Specific Requirements Related to Well Flaring and Incinerating

The following requirements apply for the use of temporary flares and incinerators.

1) Temporary flares and incinerators must comply with design and operation requirements defined in Section 7.

a) Flares and incinerators must not be operated outside design operating ranges as specified by a qualified professional engineer.

2) Licensees must determine the H_2S content of flared or incinerated gas, using Tutweiller or gas chromatography methods, as soon as practical after commencement of operation if gas analysis has not been obtained within the preceding 12 months.

3) If the H_2S content in the gas is found to exceed 50 mol/kmol H_2S and no flaring or incinerating permit has been issued by the EUB or if the H_2S content of the gas exceeds the maximum value listed in the related permit, operations must be suspended and the EUB Field Centre notified. Operations must not resume until a permit or permit amendment is issued by the EUB Operations Group in response to a written application.

4) Both high- and low-pressure gas-liquid separation stages must be used for testing sour gas wells to minimize vapour released from produced hydrocarbon liquid and sour water storage.

5) Liquid storage must be designed to prevent the escape of sour gas to the environment. (For additional detail see the Petroleum Industry Training Service's *Industry Recommended Practices for Well Testing and Fluid Handling*.)

6) Tanks and equipment used for well test flaring/incineration operations must be provided with secondary containment, as specified in EUB *Guide 55: Storage Requirements for the Upstream Petroleum Industry*. **Storage tanks must be provided with secondary containment (dikes) unless all of the following conditions are met**:

   a) The operation is staffed 24 hours per day.

   b) The tanks are equipped with a high-level device that will shut down operations (a high-level shut down [HLSD]).

   c) Notification is given to the appropriate EUB Field Centre prior to start-up.

7) All complaints received during well test flaring or incineration by the licensee must be immediately reported to the appropriate EUB Field Centre and investigated.

3.7 Temporary Facilities for In-Line Tests

To facilitate conservation the EUB may not require approvals for temporary compressor stations and other production facilities for testing of new wells.

This section of *Guide 60* does not apply to oil batteries. *Guide 56* application requirements apply to both temporary and permanent oil batteries.

1) Waiver of EUB applications requirements for temporary facilities, such as temporary connection to existing gathering systems, is intended to encourage

conservation of gas associated with well testing. The provisions do not apply to testing situations where gas will be flared.

2) Details on application requirements and exceptions for temporary well test facilities are provided in *Guide 56*. In the case of a discrepancy between *Guide 60* and *Guide 56*, *Guide 56* requirements apply.

3) Only one test period will be approved at each site.

4) Extended tests or multiple tests that require temporary facilities to operate for more than 21 days require a formal application (see *Guide 56*).

5) Proposals to install temporary compressors and other facilities for reasons other than testing new wells must comply with *Guide 56* application requirements.

6) Licensees intending to use temporary production, compression, and/or pipeline facilities must notify the appropriate EUB Field Centre and obtain approval for a variance from *Guide 56* application requirements.

   a) The notification must include a description of the proposed equipment (including relevant capacities), driver type, and layout. (For example, provide a description of the compressor power rating and note whether the driver type is gas, diesel, or electric.)

   b) Licensees intending to install and use temporary pipelines for well testing purposes must complete and submit to the appropriate EUB Field Centre the Checklist for 21-Day Temporary Surface Pipelines for Well Testing Purposes.[1]

   c) EUB Field Centre approvals for temporary facilities are valid for 21 days from the start date and include the dismantling and removal of the temporary facilities (including pipelines) from the lease. Any exceptions, including allowances for downtime during testing, must be referred to the appropriate EUB Field Centre for further review.

7) Temporary facilities, including pipelines, must meet applicable technical standards and codes and must comply with relevant EUB, Alberta Environment, and safety regulations.

   a) Temporary facilities must meet noise control requirements defined in *ID 99-08: Noise Control Directive.*

   b) Licensees must meet emergency response plan requirements for sour wells. The plan must incorporate provisions for the temporary equipment as appropriate. (See draft *Emergency Management Requirements for the Upstream Petroleum Industry* [working title].)

[1] The checklist will be available on the EUB Web site in early 2003.

8) Temporary sweetening processes, if used, must be of the zero-sulphur-emissions type. Temporary installation of regenerative sweetening processes with acid gas flaring requires a facility application, as described in *Guide 56*.

   a) All temporary or permanent sweetening facilities, including nonregenerative types, require Alberta Environment gas processing plant approval.

9) Temporary pipelines and batteries must comply with *Guide 56* public consultation requirements.

3.8 Notification and Consultation Requirements

The EUB intends that all potentially affected parties located within the notification radius as defined in Table 2 be notified that flaring will occur. The EUB does not require licensees to obtain the consent of the parties within the notification radius.

1) Licensees must notify all parties of flaring and incinerating events as defined in Table 2 (see also Oil and Gas Conservation Regulations 7.060). The notification distances in Table 2 represent *minimum* requirements.

2) Notice must be given to the appropriate EUB Field Centre of any planned flaring and incinerating activity at least 24 hours in advance.

   a) The notice to the EUB must provide a contact name and telephone number in case of complaints or emergencies (see Appendix 11).

3) Upon EUB request, licensees must provide a list of notified residents within the specified notification radius, as well as a sample of the information provided to residents.

4) Licensees must notify residents, in writing (i.e., through a mail drop), and provide them with basic information regarding the flaring and incinerating event as follows:

   a) company name, contact persons, and telephone numbers,

   b) location of the test flaring,

   c) duration of the event (i.e., start date and latest expected completion date),

   d) expected event volume and rates,

   e) information on the type of well (oil or gas) and, if applicable, information on the H_2S content of the flared gas, and

   f) EUB Field Centre contact telephone number.

5) Licensees may conduct a one-time notification program for multiple-well projects in an area. In addition to the information noted above, the related multiple-well project notification must provide

   a) the locations where flaring and incinerating will occur,

Table 2. Well test and maintenance flaring and incinerating notification requirements

Type of operation (applies to sweet and sour gas streams)	Duration of event (hrs in 24-hr period)		Gas volume (10^3 m^3 in a 24-hr period)	Notification[1]
Temporary flare for well cleanup, testing, or maintenance	< 4	and	< 30	No notification[2]
Temporary flare for gas well testing if gas contains < 10 mol/kmol H_2S	> 4	and/or	> 30	Public, 1.5 km radius; EUB Field Centre
Temporary flare for gas well testing if gas contains >10 mol/kmol H_2S	> 4	and/or	> 30	Public, 3 km radius; EUB Field Centre
Temporary flare for oil well testing	> 4	and/or	> 30	Public, 1.5 km radius; EUB Field Centre
Well test or maintenance flaring through permanent battery or plant flare	< 4		--	No public notification;[2] Notify EUB[3] if flaring >30 10^3 m^3
Well test or maintenance flaring through permanent battery or plant flare	> 4		--	Public, 0.5 km radius;[2] EUB Field Centre[3]

[1] 24 hours in advance of planned flaring operations, licensees must notify the EUB Field Centre, all rural residents outside of incorporated centres and hamlets and within the specified radius, and administrators of any incorporated centres and hamlets within the specified radius. Note that in the case of incorporated centres and hamlets, it is sufficient to contact only the appropriate administrator.

[2] The EUB encourages additional "good neighbour" notification for short-duration events to be conducted with members of the public who have identified themselves as sensitive to emissions from the facility or as interested in receiving notice of planned flaring for other reasons.

[3] See Section 5 for further information on EUB Field Centre notification requirements.

b) the period during which the project will be carried out, and

c) the expected duration and volume of typical tests.

6) Licensees may limit the number of repeat notifications to individual residents if

a) the resident requests that the number of notifications be reduced,

b) the licensee provides the resident with an outline of expected flaring and incinerating activities in the area, and

c) in the case of well tests, the licensee documents the agreement to reduced well test flare notifications in writing and obtains the signature of the resident(s) to ratify the agreement. A copy of this letter agreement must be provided to the EUB upon request.

7) Licensees may conduct a single notification for underbalanced drilling and related well test programs to each resident within the notification area and the EUB Field Centre, rather than a separate notification for each flaring period throughout the program, if this is acceptable to the potentially affected parties. The method of notification should be discussed during the initial notification process.

3.8.1 Addressing Issues and Public Concerns

1) Licensees must address public concerns about well test flaring and temporary flaring and incinerating that arise from notification prior to commencing the activity. This applies regardless of whether or not a permit is required.

2) Licensees must disclose any unresolved public objections and/or concerns to proposed flaring and incinerating activities to the EUB prior to initiating related activities.

   a) In cases where a permit is required, licensees must disclose known public objections and/or concerns in related permit application packages submitted to the EUB.

   b) In situations where objections and/or concerns are received after the EUB has issued a permit or where no permit is required, licensees must notify the EUB Field Centre.

   c) Licensees must not proceed with well test flaring or temporary flaring and incinerating if public objections to that activity are outstanding unless specific approval to do so is given by the EUB Field Centre.

3.8.2 Resolving Public Concerns and Objections

In situations where a permit is not required and public concern has not been addressed by the licensee, the public may make a complaint to the local EUB Field Centre. EUB staff will then respond to the complaint according to established procedures. If the licensee is in compliance with *Guide 60* and has appropriately considered any unique circumstances and the EUB Field Centre determines that the planned flaring and incinerating can be carried out in a safe manner, the operations will be allowed to proceed.

In situations where a permit is required and public concern has not been addressed by the licensee, the public may submit a written objection to the permit application with the EUB.

The following process applies in situations where objections to flaring and incinerating are not resolved.

1) The objector must notify the licensee and/or the appropriate EUB Field Centre **in writing** (by letter, fax, or e-mail) that there is an objection to the flaring or incinerating and outline the reason(s) for the objection.

2) The objector and the licensee are expected make a reasonable effort to resolve the matter themselves.

3) If the parties make reasonable efforts to resolve the matter between themselves and no agreement is reached, they may request assistance from the appropriate EUB Field Centre to facilitate further discussions.

   a) The EUB Field Centre will review the licensee's flaring and incinerating evaluation report and the objector's documentation. The Field Centre will assist the parties with clarification of requirements and explanation of outcomes in similar situations to facilitate resolution between the parties.

b) In situations where the parties cannot come to resolution but where requirements and practices are clear **and there is no flare permit involved**, the EUB Field Centre may decide the matter.

4) If after EUB Field Centre intervention, the objection still is not resolved to the satisfaction of all parties, the Field Centre may recommend that the parties consider the formal Appropriate Dispute Resolution process (see *IL 2001-01*) or refer the objection within the EUB for review.

5) In situations where objections to flaring and incinerating permits cannot be resolved, the objection will be referred to the EUB Board for disposition.

3.8.3 EUB Flaring/Incinerating/Venting Notice Form

1) In order to comply with the requirements outlined in Section 3.8 above, licensees are required to complete the EUB Flaring/Incinerating/Venting Notice Form on line using the EUB's Field Information System (FIS) and submit it electronically to the local EUB Field Centre, as described in Appendix 11.

3.9 Reporting Gas Well Test Data

1) Well test results and information required by flaring and incinerating permits must be submitted in accordance with the requirements of *Guide 40*, *Guide 52: Electronic Capture of Well Test Data*, the applicable permit, and Section 10.

a) All well test reports must be submitted, as per *Guide 52*, within three months of completing the fieldwork. This information must include the volume of gas produced to flare, vent, or pipeline, as well as all gas analyses from samples gathered at the wellhead, and must be submitted to the EUB Production/Well Data Services Group.

2) All well tests that require permits must submit a Sour Gas Flaring Summary Report to the EUB Operations Group within three weeks of the completion of flaring activities (see Section 10.5 and Appendix 12).

3) All flaring and incinerating at a well site (including well tests) must also be reported on the appropriate production reporting submissions, as explained in *Guide 7*.

a) In order to be able to report to the EUB, the licensee must obtain a battery code. Any produced volumes, including those flared or incinerated, must be reported as outlined in *Guide 7*.

b) Fluid volumes and fuel consumption must be recorded and reported on the monthly production submissions (see Section 10.4).

4 Gas Battery Flaring, Incinerating, and Venting

This section addresses gas battery flaring, incinerating, and venting and includes

- routine flaring, incinerating, and venting of low-pressure flash-gas and other gas streams,
- nonroutine flaring, incinerating, and venting for equipment depressuring for maintenance, and
- nonroutine flaring, incinerating, and venting for emergency depressuring for safety reasons.

4.1 Gas Battery Flaring, Incinerating, and Venting Decision Tree

1) Licensees must use the decision tree analysis shown in Figure 5 to evaluate new and existing gas battery flares, incinerators, and vents.

   a) While the EUB encourages licensees to evaluate all sources of flared, incinerated, and vented gas, it does not require evaluation of intermittent small sources, such as pig trap depressuring.

2) New batteries must be evaluated at the time of application as part of the facility design, while flare and vent evaluations for all existing batteries must be completed by December 31, 2004.

3) Licensees must conserve routinely flared or vented gas if it is economic to do so using the economic test in Section 2.7.

4) Licensees must assess opportunities to eliminate or reduce nonroutine flaring, incinerating, and venting of gas due to frequent maintenance or facility outages.

   a) Licensees must investigate and correct repeat nonroutine events at gas batteries.

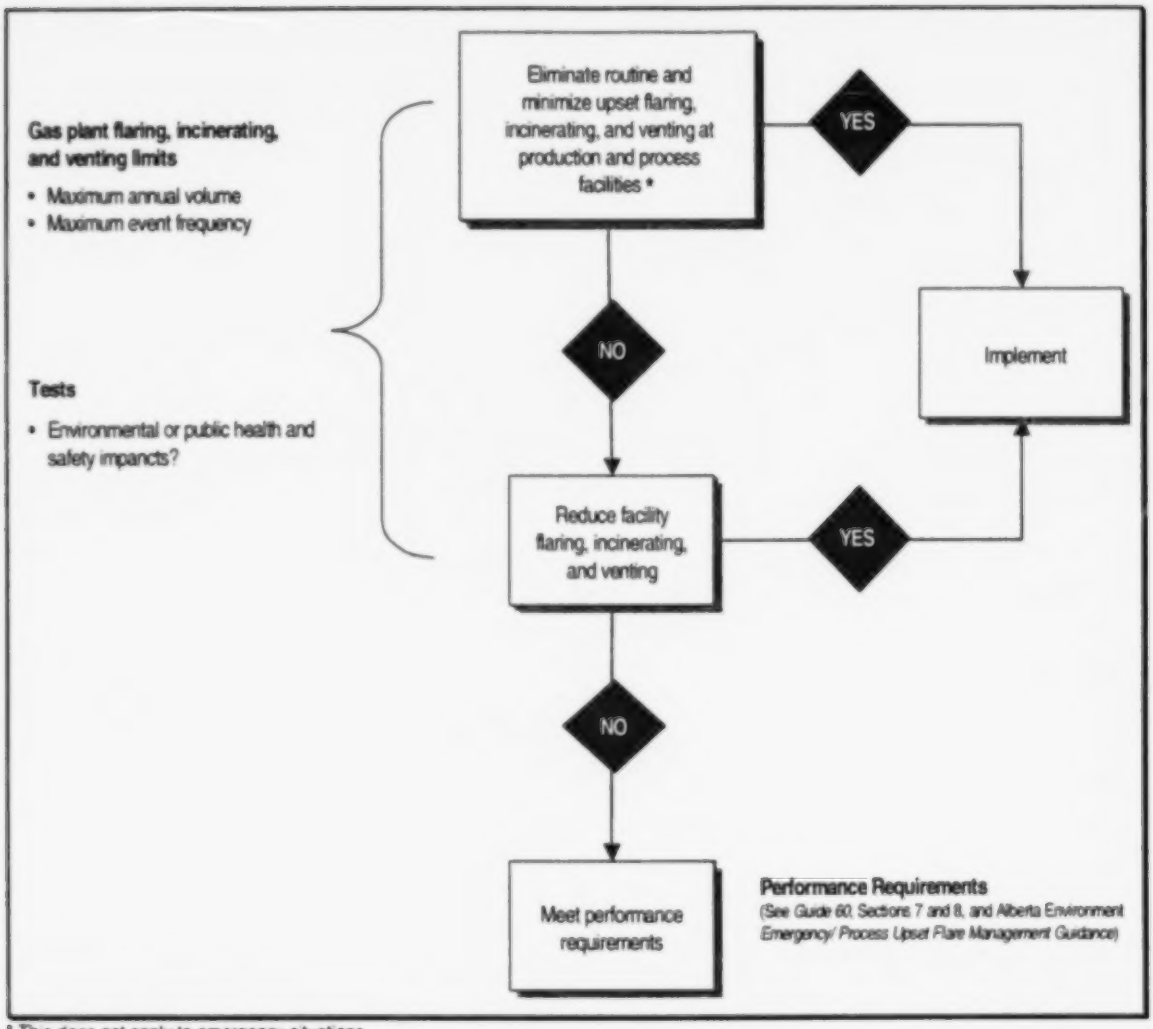
   b) Licensees must address public complaints and concerns related to nonroutine gas battery flaring.

5) Flare, incinerator, and vent systems must be designed and operated in compliance with Sections 7 and 8, good engineering practice, and relevant safety codes and regulations. All permanent flare stacks installed prior to January 1, 2000, must implement the results of the decision tree evaluation by December 31, 2004.

4.2 Notification

1) Licensees must notify the public and the EUB of nonroutine flaring at gas batteries as follows:

   a) If gas battery flaring exceeds 4 hours in duration, public notification is required, as described in Section 2.8 and Table 1.


Gas plant flaring, incinerating, and venting limits
• Maximum annual volume
• Maximum event frequency
Tests
• Environmental or public health and safety impacts?
Eliminate routine and minimize upset flaring, incinerating, and venting at production and process facilities *
YES
NO
Implement
Reduce facility flaring, incinerating, and venting
YES
NO
Meet performance requirements
Performance Requirements
(See Guide 60, Sections 7 and 8, and Alberta Environment Emergency/ Process Upset Flare Management Guidance)

* This does not apply to emergency situations.

Figure 5. Facility Flaring, Incinerating, and Venting Decision Tree (adapted from CASA)

b) If a gas battery flaring event exceeds 30 10^3 m^3 and/or 4 hours in duration, the EUB Field Centre must be notified (see Table 1). In cases where notification requirements are outlined in this guide and in *IL 98-01*, licensees must comply with the more stringent requirement.

2) Licensees must provide the EUB Field Centre with a minimum of 24 hours' advance notice of planned gas battery outages and turnarounds that will result in flaring greater than 30 10^3 m^3 and/or 4 hours duration.

4.3 Reporting

1) All monthly flared, incinerated, and vented volumes must be reported separately on the Petroleum Registry of Alberta (see Section 10.4).

a) In order to initiate reporting capabilities, the licensee must obtain a battery code.

2) Gas burned in an incinerator must be reported as flared. Fuel gas burned in an incinerator must be reported as fuel gas.

3) Gas flared or vented at gas batteries must be reported at the location where the flaring or venting took place. For unlicensed facilities (such as small booster compressors or pig traps), the flared and vented volumes must be reported at the nearest upstream reporting well, battery, or pipeline facility.

5 Gas Plant Flaring, Incinerating, and Venting

This section addresses disposal of gas from gas processing plants by flaring, incinerating, and venting. Sources of natural gas flaring, incinerating, and venting at gas production facilities include

- routine flaring, incinerating, and venting of low-pressure flash-gas and other gas streams;
- nonroutine flaring, incinerating, and venting for equipment depressuring for maintenance; and
- nonroutine flaring, incinerating, and venting for emergency depressuring for safety reasons.

5.1 Gas Plant Flaring, Incinerating, and Venting Decision Tree

Licensees must use the decision tree analysis shown in Figure 5 to evaluate new and existing gas processing plant flares, incinerators, and vents.

1) New facilities must be evaluated at the time of application as part of the plant design, while flare and vent evaluations for all existing plants must be completed by December 31, 2004.

   a) While the EUB encourages licensees to evaluate all sources of flared or vented gas, it does not require evaluation of intermittent small sources such as pig trap depressuring.

2) Licensees must conserve routinely flared or vented gas if it is economic to do so using the economic test in Section 2.7.

3) Licensees must assess opportunities to eliminate or reduce nonroutine flaring, incinerating, and venting of gas due to frequent maintenance or facility reliability outages, as well as

   a) investigate public complaints and concerns related to nonroutine flaring, and

   b) comply with the limitations on total flared and vented volumes and number of repeat events defined in Sections 5.2 and 5.3.

4) Flare, incinerator, and vent systems must be designed and operated in compliance with Section 7 and 8, good engineering practice, and relevant safety codes and regulations. All permanent flare stacks installed prior to January 1, 2000, must implement the results of the decision tree evaluation by December 31, 2004.

   a) Gas streams directed to continuous gas plant flares must have a minimum heating value as defined in Section 7.3 effective January 1, 2000.

   b) The EUB recognizes that short-duration emergency flaring with a gas heating value of less than 20 megajoules (MJ)/m^3 may occasionally be necessary. Sour gas plant emergency systems, however, must be configured to ensure that the flared gas heating value is not less than 12 MJ/m^3.

5.2 Gas Plant Flaring Volume Limits

The EUB limits the total annual volume of gas disposed of by flaring, incinerating, and venting at gas processing plants. Fuel gas used for pilots or flare system purge, as well as acid gas volumes from gas sweetening (which are normally continuously flared), are excluded from the following limits:

1) Flaring, incinerating, and venting must not exceed 1% of raw gas receipts in the first year of operation and must not exceed 0.5% of receipts in any year thereafter for gas plants processing less than 1.0 billion (10^9) m^3 per year (raw gas inlet volume).

2) Flaring, incinerating, and venting must not exceed the greater of 0.2% of receipts or 5.0 10^6 m^3 per year for gas plants processing more than 1.0 10^9 m^3 per year.

3) In cases where multiple flare stacks are available in gas production, gathering, and processing systems, licensees must use the flare stack that is the most efficient and capable of providing the best dispersion. In most cases this would be the gas plant flare stack.

   a) Licensees can deduct solution gas flared at gas plants during plant shutdowns lasting more than seven days in calculating the annual flared volumes applicable to items (1) and (2) above.

4) Licensees must comply with the solution gas reduction limitations of Section 2.10 during facility outages.

5.3 Frequent Flaring Events

Information on enforcement actions related to exceeding the critera outlined below is provided in Section 12.1.

1) Licensees must investigate and correct causes of repeat nonroutine flaring, incinerating, and venting.

2) Gas plants must not exceed six major flaring events in any consecutive (rolling) six-month period (6-in-6). Major flaring events are defined in Table 3.

Table 3. Major flaring event definition

Approved plant inlet capacity	Major flaring event definition*
> 500 10^3 m^3/d	100 10^3 m^3 or more
150 - 500 10^3 m^3/d	20% of plant design daily inlet or more
< 150 10^3 m^3/d	30 10^3 m^3 or more

* The definition of a flaring event includes situations where
1) volumes greater than or equal to those specified in the table are flared in any single day; each day where specified flared volumes are exceeded is considered to be a separate, individual event; or
2) volumes greater than or equal to those specified in the table are flared in one contiguous period spanning more than one day (for example, flaring for four days at a continuous rate of 25 10^3 m^3/d is considered to be one event).

3) Licensees must log and monitor major flaring events, as required in Section 10.5. Should a sixth event occur within any consecutive (rolling) six-month period:

   a) Licensees must submit a written "exceedance" report to the appropriate EUB Field Centre and copy this report to the EUB Operations Group within 30 days of the occurrence of the sixth flaring event.

      i) The exceedance report must provide data on all flaring events (volume and duration) for the consecutive (rolling) six-month period in question and their possible causes.

      ii) The report must also propose a plan and corresponding timeline for implementing corrective actions to ensure that frequent major nonroutine flaring does not recur.

   b) Licensees must obtain EUB approval of the proposed action plan.

      i) EUB approvals for proposed facility modifications, if required by *Guide 56*, must be obtained prior to implementing any proposed corrective actions.

      ii) Upon EUB approval, licensees are expected to expedite schedules for implementing corrective actions.

5.4 Notification

1) Licensees must notify the public and the EUB of nonroutine flaring at gas plants.

   a) The EUB Field Centre must be notified if a nonroutine flaring event exceeds 30 10^3 m^3, exceeds 4 hours' duration, or is likely to cause public concern (see Appendix 11 for notification procedure).

   b) In cases where more stringent notification requirements than required by this guide have been put in place through *IL 98-01*, licensees must comply with the more stringent requirements.

   c) Licensees must provide the EUB Field Centre with a minimum 24 hours' advance notice of plant turnarounds and related flaring.

5.5 Reporting

Measurement and reporting requirements for gas plants include the following:

1) All monthly flared, incinerated, and vented volumes must be reported separately on the Petroleum Registry of Alberta (see Section 10.4). This information is then summarized in EUB *ST-13A* and *ST-13B*.

2) Flaring or incineration of sour gas must also be reported on the Sulphur Balance Report available in *Guide 7*.

3) When measurement is not required, engineering estimates must be used to report any flared gas not measured (see Section 10.2).

4) Licensees must provide a documented system for measurement and/or estimation of flared and vented gas volumes (as defined in Section 10) upon EUB request.

5) Licensees must provide information on flaring and related public complaints, as defined in Section 10.5, upon EUB request.

6) Licensees must monitor and minimize fuel gas use for flare header purge, flare and incinerator pilots, and fuel gas supplementation of low-heating-value flared gases. Excessive fuel gas use for flare pilots and purge gas can contribute significantly to fuel use.

   a) Licensees must examine flare fuel gas use in cases where it appears that this use is excessive. The EUB will require such examination on the basis of case-specific audits and inspections.

   b) Licensees must measure and report total fuel gas usage on monthly production submissions. An engineering estimate may be used to determine the split between residue fuel gas (processed gas) and overhead fuel gas (gas from plant vessels), as gas used in this manner is reported as fuel (i.e., not as flared).

7) Fuel gas that is flared, incinerated, or vented (e.g., flare pilot gas, header purge gas, storage tank blanket gas) must be reported as fuel gas, not flared gas.

6 Pipeline Flaring, Incinerating, and Venting

This section addresses disposal of gases from gas gathering and transmission lines by flaring, incinerating, and venting. Sources of natural gas flaring, incinerating, or venting at gas production facilities include

- routine flaring, incinerating, and venting of low-pressure flash-gas and other gas streams at pipeline system compressor and dehydration facilities, and
- nonroutine flaring, incinerating, and venting for pipeline depressuring for maintenance or emergencies.

6.1 Pipeline Systems Flaring, Incinerating, and Venting Decision Tree

1) Licensees must use the decision tree analysis shown in Figure 6 to evaluate new and existing gas pipeline system flares and vents.

2) New pipelines must be evaluated at the time of application as part of the pipeline design, while flare and vent evaluations for all existing pipelines must be completed by December 31, 2004.

   a) While the EUB encourages licensees to evaluate all sources of flared or vented gas, it will not require evaluation of intermittent small sources such as pig trap depressuring.

3) Licensees must conserve routinely flared or vented gas if it is economic to do so using the economic test in Section 2.7.

4) Licensees must assess opportunities to eliminate or reduce nonroutine flaring, incinerating, and venting of gas due to frequent maintenance or facility reliability outages.

   a) Licensees must investigate and correct repeat nonroutine events at gas pipelines and related facilities (i.e., compressor stations).

   b) Licensees must address public complaints and concerns related to nonroutine pipeline facility flaring.

   c) Licensees must investigate and implement feasible measures to conserve gas from depressuring of pipeline systems.

5) Licensees of gas pipeline systems must ensure that flares, incinerators, and vents are designed and operated in compliance with Sections 7 and 8, good engineering practices, and all relevant safety codes and regulations. All permanent pipeline flares installed prior to January 1, 2000 must be evaluated by December 31, 2004.

6) The sulphur recovery requirements of Section 9 and *ID 2001-03: Sulphur Recovery Guidelines for the Province of Alberta* apply to any continuous flaring or incineration of sour gas at gas gathering facilities (i.e., compressor or dehydrator sites).

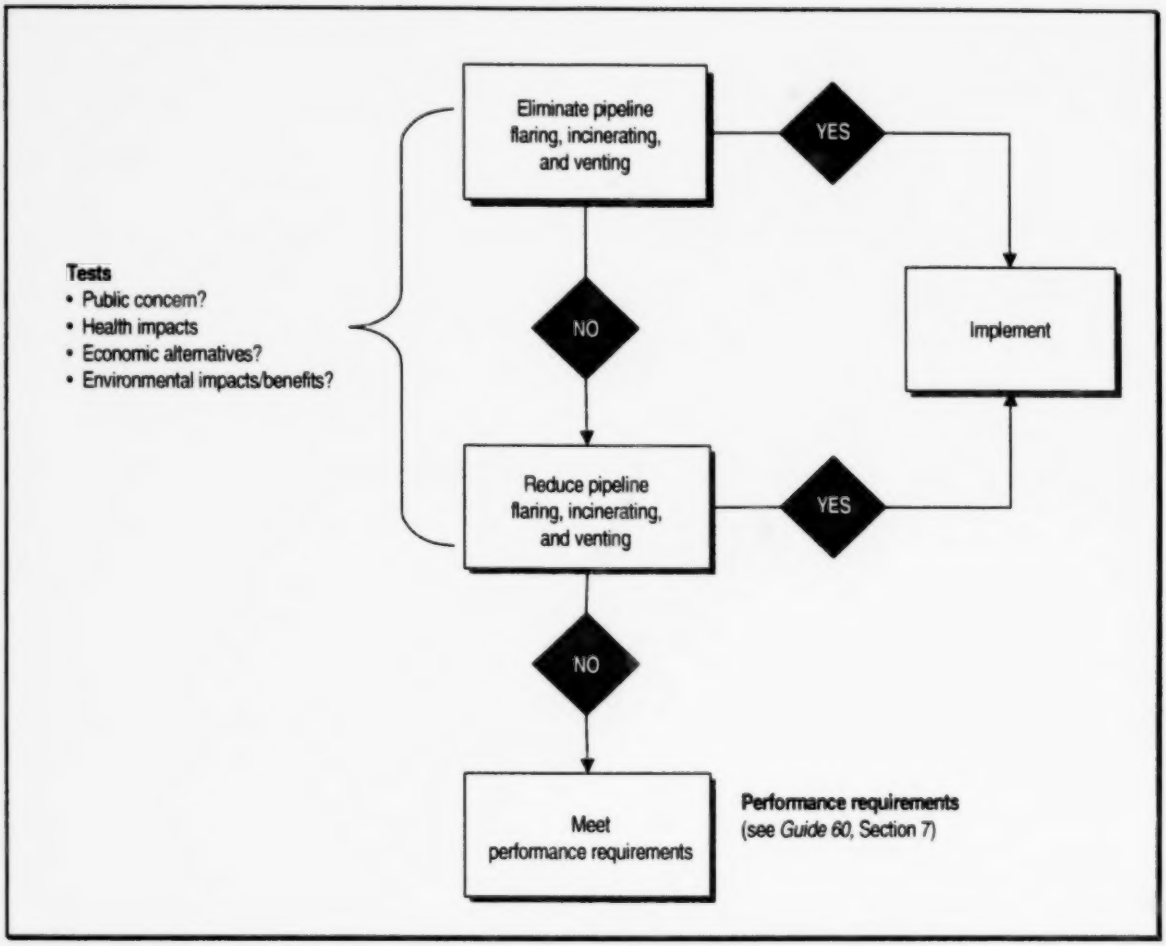


Figure 6. Pipeline Flaring, Incinerating, and Venting Decision Tree (adapted from CASA)

6.2 Additional Requirements for Gas Gathering Systems

1) All monthly flared, incinerated, and vented volumes must be reported separately on the Petroleum Registry of Alberta (see Section 10.4).

2) Gas containing H_2S must not be released from a pipeline intentionally without the consent of the EUB, unless the gas is burned in an approved manner.

   a) Operators must not vent gas containing H_2S into the atmosphere without first submitting a proposal to the Pipeline Section of the EUB Operations Group (see Alberta Pipeline Regulation, Section 57).

   b) Any proposal to vent H_2S gas must address public safety issues and include provisions for safely disposing of blowdown gas and for notifying the public of potential hazards (including the posting of suitable notices).

3) Licensees must obtain an EUB flare permit to use temporary flares or incinerators for the disposal of sour gas containing more than 50 mol/kmol H_2S, as described in Section 3.2.

   a) Permits are not required for short-duration disposal of small quantities of sour gas (see Section 3.2.2).

   b) Permit application requirements (Section 3.4) apply to temporary flares or incinerators used for sour gas pipeline depressuring.

4) The public must be notified at least 24 hours in advance of planned flaring or incineration events if temporary equipment is used. Notification requirements described in Table 2 apply.

6.3 Application of *Guide 60* to Natural Gas Transmission Systems

This guide applies to flaring, incinerating, and venting in conjunction with natural gas transmission systems subject to the following provisions:

1) Licensees of sweet natural gas transmission pipelines must minimize venting and flaring volumes.

   a) The economic evaluation in Section 2.7 is not applicable for evaluating conservation of gas from nonroutine pipeline depressuring for maintenance.

   b) Licensees must evaluate conservation of gas from planned nonroutine pipeline depressuring having regard for the value of gas, costs of conserving the gas, and economic impacts of extending outages on downstream customers and upstream producers.

2) Flaring or incinerating of gas from sweet natural gas transmission pipeline depressuring may not be practical when impacts on system customers and producers are considered. In such situations the EUB Operations Group may allow venting of gas to reduce the duration of system outages and related impacts.

6.4 Notification

1) Licensees must notify the public and the EUB of nonroutine flaring at licensed gas pipeline facilities as follows:

   a) If pipeline facility flaring exceeds 4 hours in duration, public notification is required (see Section 3.8 and Table 1).

   b) In areas where more stringent notification requirements than those defined in Table 1 are required by *IL 98-01*, licensees must comply with the more stringent requirements.

2) Licensees must provide the EUB Field Centre with a minimum 24 hours' advance notice of planned pipeline facility outages that will result in flaring or venting.

3) When nonroutine pipeline venting or flaring is planned, sweet natural gas transmission companies must notify the appropriate EUB Field Centre and discuss the measures taken to minimize emissions.

4) Each purchaser or transporter of sweet natural gas must report the particulars of the disposition and delivery of its gas to the EUB on a monthly basis (Oil and Gas Conservation Regulations 12.051).

   a) Flared and vented volumes of sweet natural gas must be reported separately from each other.

7 Gas Combustion Requirements

This section includes design criteria to ensure the effective combustion of gases.

1) Licensees must design, operate, and maintain flare systems to safely dispose of gas that must be released into the atmosphere.

   a) Flares, incinerators, and other gas combustion systems, including those using sour gas as a fuel for production or process equipment, must be designed so that emissions do not exceed the Alberta Ambient Air Quality Guidelines.

2) The gas combustion requirements apply to flares, incinerators, and other types of enclosed burners in all upstream industry oil and gas systems for burning sweet, sour, and acid gas, including equipment used for well completion, servicing, and testing.

3) The EUB expects that licensees will use best engineering practices in the design and operation of flare systems. including those in CAPP's *Best Management Practice: Flaring of Associated and Solution Gas*, as well as appropriate engineering codes and standards.

   a) ***Guide 60* is not a substitute for comprehensive engineering design codes and guidelines.** It identifies minimum regulatory requirements but is not intended as a comprehensive design manual.

   b) Licensees must comply with Alberta safety regulations with respect to the design of pressure vessels and piping systems and the design of equipment and operating procedures (see Alberta Regulation 293/94 Boilers and Pressure Vessels).

   c) Licensees must ensure that qualified professional engineers are responsible for the design of flare and incinerator systems and related piping systems and for the specification of safe operating procedures.

      i) *API-RP-521: Guide for Pressure-Relieving and Depressuring System*, Section 4: Selection of Disposal Systems, as well as applicable fire safety codes, electrical codes, CSA standards, and mechanical engineering standards, are all necessary references for the design of gas combustion systems.

4) The EUB encourages the use of alternatives to conventional flare technology, such as incinerators, that have been demonstrated to provide high combustion efficiencies and minimize the formation of undesirable products of incomplete combustion.

7.1 Minimum Combustion Efficiency

Combustion efficiency research will be reviewed by the CASA Flaring/Venting Project Team in 2003. Following that review, the EUB may set minimum combustion efficiency standards for flares.

1) The EUB expects that flares will be designed and operated with sufficient combustion efficiency to control odour and visible smoke emissions.

   a) The EUB recommends that licensees assess combustion efficiency of new and poorly performing stacks used for routine flaring using methodologies recently published by the Department of Mechanical Engineering, University of Alberta, or those of proprietary flare equipment providers.

2) Licensees using incinerators and enclosed burners must be able to provide detail about the combustion efficiency design of the equipment upon request of the EUB. Either of the following is considered to be acceptable evidence of compliance with this requirement:

   a) the manufacturer's independently verified combustion efficiency test results, provided that the tests were conducted under conditions representative of the facility design, or

   b) actual field measurements of combustion efficiency from the operating facilities following start-up.

3) Licensees must modify or replace existing flares or incinerators if low combustion efficiency under normal operating conditions is contributing to off-lease odours, odour complaints, or frequent black smoke emissions.

7.2 Visible Emissions

1) Smoke emissions from a well, battery, or gas plant must be controlled in accordance with Oil and Gas Conservation Regulations 7.040(1) and 9.050(6)(d), except under emergency circumstances due to equipment failure or as otherwise approved by the EUB.

   a) Routine gas combustion must not result in continuous or repeat visible black smoke emissions.

   b) Black smoke from nonroutine or emergency flaring must not exceed an average of 40% opacity over six consecutive minutes or as defined subsequent to the issue of this guide in the Alberta Environmental Protection and Enhancement Act substance release regulations.

2) Any visible emissions that may result in public concern must immediately be reported to the local EUB Field Centre (see also Section 2.9).

7.3 Flame Stability and Minimum Heating Value for Acid Gas Flares

1) Sufficient fuel gas must be added to flared sour gas, acid gas, or other low heating value gas streams to ensure stable and efficient combustion, as well as compliance with the Alberta Ambient Air Quality Guidelines and specific EUB/Alberta Environment approvals.

   a) Fuel make-up must be specified for acid gas flare stacks by qualified technical professionals.

   b) Equipment controls must be installed and operating procedures must be documented to ensure minimum fuel gas make-up during routine and emergency operating conditions.

   c) Operating procedures and equipment controls design information must be provided to the EUB upon request.

   d) Facilities must be operated in compliance with specified minimum fuel gas make-up requirements.

2) The combined net or lower heating value of acid gas plus make-up fuel gas directed to a flare must not be less than 12 MJ/m^3 under any circumstance.

3) The combined net or lower heating value of acid gas plus make-up fuel gas directed to a flare must not be less than 20 MJ/m^3, unless existing stacks have an established history of stable operation and compliance with Alberta Ambient Air Quality Guidelines. (Licensees are expected to support claims that existing stacks have operated satisfactorily over time).

   a) Licensees must assess existing acid gas flares as part of the flare decision tree evaluation required in Section 5.1.

      i) The evaluation of flare stacks used for continuous flaring of acid gas and other low heating value streams must include an evaluation of flame stability, odour complaint history, and stack performance to meet Alberta Ambient Air Quality Guidelines.

   b) In cases where flare stacks have a history of flame failure, odour complaints, and/or Alberta Ambient Air Quality Guidelines exceedances, licensees must operate with a combined flare gas heating value of not less than 20 MJ/m^3.

   c) If modifications are made to increase flame stability and performance, licensees may be allowed to reduce the combined flare gas heating value to a minimum of 12 MJ/m^3. In such cases, licensees must first provide related stack design information and combustion efficiency evaluations to the EUB in order to demonstrate that minimum combustion requirements (Section 7.1) can be achieved.

7.4 Flare Ignition

1) A flame must be present whenever gases are released to a flare.

2) Acid gas and sour gas flares must have reliable systems to ensure continuous ignition of any gas that may discharge to the flare.

   a) Flare stacks at gas plants where gas contains more than 10 parts per million (ppm) H_2S must be equipped with both pilots and automatic ignition.

   b) A pilot or automatic ignition device must be installed on flares for continuous (e.g., sour water or condensate tank flash-gas) or intermittent (e.g., emergency depressuring) sources at facilities other than gas plants if the gas contains more than 10 mol/kmol H_2S.

   c) In situations where repeat off-lease odour or other impacts have resulted from failure to ensure ignition of sour gas, regardless of H_2S content, the EUB may require installation of

      i) both pilots and automatic ignition, and/or

      ii) flame failure detection and alarms.

3) Manual flare ignition subject to good fire safety practices will be accepted for blowdown stacks or flares installed for maintenance purposes where

   a) no continuous gas flow exists, and

   b) no automatic relieving systems are connected to the stack.

7.4.1 Application for Extinguishing Flare Pilots at All Batteries

Significant volumes of fuel gas are used to sustain pilots for emergency flares at producing facilities. Continuous pilots are necessary where gas is flared on a constant or routine basis or where sour gas can potentially be released from pressure safety valves (PSVs) or emergency shutdown valves (ESDVs). In situations where gas is not continuously or routinely flared, where ESDVs are not configured to depressure facilities to flare, and where maximum foreseeable operating pressures are well below PSV release pressures, the potential exists to safely conserve natural gas by extinguishing the flare pilots.

When considering an application to extinguish flare pilots, the EUB Field Centre takes into account both local conditions and the operating history of the facility.

1) Licensees must obtain approval from the local EUB Field Centre to extinguish flare pilots at sour gas batteries.

2) Approvals are only considered if

a) the maximum design operating pressure of production piping and pressure vessel systems is greater than 105% of the maximum stabilized static wellhead pressure of all wells connected to the battery;

b) there will be no continuous or routinely flared gas streams;

c) The facility is connected to sweet or level-1 and level-2 sour wells, as defined in *ID 97-06: Sour Well Licensing and Drilling Requirements*;

d) no active injection or cycling schemes are taking place in or planned for any pools with wells connected to the facility;

e) the facility connections to the flare are isolated with rupture disks upstream of PSVs and double block valves on manual depressuring valve.

Further details on application requirements and limitations are provided in Appendix 13.

7.5 Stack Height

1) Flare stacks must be designed so that the maximum radiant heat intensity at ground level will not exceed 4.73 kilowatts (kW)/m^2.

   a) Ground-level radiant heat determinations must be based on calculation procedures outlined in *API-RP-521*, Section 4.4.2.3, or *GPSA Engineering Data Book* (11th edition), Section 5.

   b) Exceptions to this requirement will be considered on application to the EUB Operations Group, provided an equivalent level of safety can be ensured.

      i) In such cases licensees must restrict access to the area where the radiant heat intensity guideline could be exceeded and must ensure that this area is free of combustible materials and vegetation. Access restrictions are expected to include an appropriate fence with warning signs.

      ii) Appropriate procedures (e.g., safe-work permit system) must be in place when it is necessary to work within the area where the radiant heat intensity guideline could be exceeded.

2) Flares, incinerators, and enclosed burners located within a distance of 5 times the height of neighbouring buildings must have a height of at least 2.5 times the height of the highest building.

   a) The foregoing does not apply to devices for destruction of trace vent gases, such as those emitted from gas dehydrators.

3) Stacks for acid or sour gas containing more than 10 mol/kmol H_2S must have a height that is the greater of that specified in (1) and (2) above and

   a) a minimum of 12 m above ground level for flares, and

b) the height required to provide adequate plume dispersion to comply with the Alberta Ambient Air Quality Guidelines for SO_2 for flares, incinerators, and enclosed burners (see Section 7.15).

7.6 Emergency Sour and Acid Gas Flaring/Incineration Procedures

This section takes precedence, as applicable, over the flare reduction requirements listed in Table 1.

In some instances where sour or acid gas rates are very large, it is not practical to design flare or incinerator stacks with sufficient height and to add sufficient fuel gas to permit continuous emergency flaring in compliance with the Alberta Ambient Air Quality Guidelines. In such cases the following applies:

1) Flares and incinerators for short-duration emergency combustion of sour or acid gas must be evaluated using the methods described in Sections 3.5, 7.15, and/or Alberta Environment's *Emergency/Process Upset—Flaring Management Modelling Guidance*.

   a) It is not necessary to complete a cumulative assessment if the emergency flaring condition is reasonably expected to be of short duration (less than 4 hours). Cumulative assessment requirements are intended to address the effects of multiple and/or continuous SO_2 sources in a given area (see Section 7.15.3).

      i) Operating procedures must be put into place to limit the duration of flaring if the emergency stack design is based on the above exception.

      ii) If flaring of sour or acid gas for periods greater than 4 hours could occur under planned operating procedures, then a cumulative assessment must be completed.

   b) Assessment information must be provided to the EUB upon request.

2) Operating controls for flares and incinerators for short-duration emergency combustion of sour or acid gas must be designed to ensure compliance with the Alberta Ambient Air Quality Guidelines for SO_2.

   a) The EUB will allow use of its low-risk criteria (see Section 3.5) for design of short-duration emergency flaring procedures.

   b) Operating procedures and controls must be documented and implemented if it is not feasible to design sour or acid gas emergency stack heights to comply with one-hour Alberta Ambient Air Quality Guidelines for SO_2 under high flow rate conditions.

      i) Automated shutdowns must be installed in semi-attended facilities to ensure compliance with this requirement.

c) Operating procedures must be clearly communicated to operating staff responsible for flare system operations.

d) Operating procedures and related dispersion evaluations must be provided to the EUB upon request.

3) Flaring and incinerating gas are not alternatives for addressing concerns about brackish water, completion fluids, or solids entering the pipeline. In such situations, discharge of liquids or solids to a flare or incinerator is unacceptable. Proper gas-liquid separation facilities adequate to protect the pipeline system or a flare must be used.

7.7 Liquid Separation

Entrained liquids in flare or incinerator streams reduce combustion efficiency and contribute to increased emissions of total reduced sulphur compounds, hydrocarbons, and products of incomplete combustion.

1) Design information on flare/incinerator system liquid separation equipment must be submitted upon request to the EUB as part of *Guide 56* facilities application review processes.

2) Liquid separation equipment must be provided in both temporary (well test) and permanent flare/incinerator systems to prevent the carryover of liquid hydrocarbons, water, or other liquids.

3) Flare separators must be designed for the removal of 300 micron diameter and larger liquid droplets.

a) Designs must be based on the lowest density hydrocarbon liquids that could be released to the flare system.

4) The flare separator or knockout drum must be designed to have sufficient holding capacity for liquid that may accumulate as a result of upstream operations, such as hydrocarbon carryover, liquid slugs, and line condensation.

5) All separators, including well test flaring or knockout drums, must be provided with visual level indicators and/or high-level alarms, as well as operating procedures to ensure that the liquid retention in the vessel will not exceed the maximum design liquid level during all operating conditions.

a) Flare separators in facilities constructed after the date of this guide must be equipped with high-level alarms in addition to liquid level indication.

b) High-level alarms and shutdowns must be installed on flare separators where liquid streams are directed to the separator for storage or where free liquids are contained in continuously flared streams.

c) The flare separator high-level alarm must be connected to facility alarm panels and/or semi-attended facility alarm call-out systems if the facilities are so equipped.

d) Well test vessels receiving production from oil wells must be equipped with an HLSD.

6) Flare separator or knockout drums used for liquid storage must be designed and operated to meet the requirements listed in EUB *Guide 55*.

7.7.1 Exceptions to Flare Separator Requirements

The EUB may not require independent flare separators in situations where the only vessels connected to the flare are production separators equipped with an HLSD (or equivalent devices) or with a system that prevents liquids from entering the flare line.

The following limitations apply to this exception:

1) The HLSD must be configured to shut down and block in, but not depressure, the battery. The HLSD trip level must be set so that adequate vapour-liquid separation is not impaired at maximum liquid level and vapour flow rates.

2) If liquid carryover involving spills occurs around the flare or if smoky flare events occur, licensees must install adequately sized flare separators.

7.8 Backflash Control

Inadequately purged flare systems may have sufficient oxygen present to support combustion. Backflash may occur when the linear velocity of the combustible mixture of gas and air in the flare system is lower than the flame velocity.

1) Licensees must take precaution to prevent backflash using appropriate engineering and operating practices, such as

a) installation of flame arresters between the flare tip and the flare separator;

b) provision of sufficient flare header sweep gas velocities to prevent oxygen intrusion into the flare system; and

c) safe work procedures to ensure complete purging of oxygen from flare systems prior to flare ignition.

2) Operators must provide information on backflash controls to the EUB upon request.

7.9 Flare and Incinerator Spacing Requirements

The EUB expects licensees to follow good engineering and safety practices in the layout of facilities. Notwithstanding flare separation requirements, unexpected liquid carryover to flares can happen. Adequate separation of flares from areas frequented by workers and

from sources of combustible gas is prudent. The EUB expects licensees to consult fire protection codes and guidelines as part of facility design.

1) Flares, incinerators, and enclosed gas burners must be located at least

   a) 50 m away from wells

   b) 50 m away from flammable liquids storage tanks

   c) 25 m away from any oil and gas processing equipment

      i) The foregoing does not apply to combustion devices for destruction of trace vent gases, such as those emitted from gas dehydrators. These devices must be designed to prevent ignition of gas that may leak from surrounding equipment (i.e., devices equipped with flame arresters).

   d) 25 m away from flare separators for systems constructed after the effective date of this guide

      i) The EUB will not require relocation of flare separators constructed prior to the effective date of this guide provided adequate safety procedures are in place for staff working in proximity to the separators.

2) Flares, incinerators, and enclosed burners must be located, designed, and operated so that no hazard to public property is created. Flares must be at least

   a) 100 m away from surface improvements (with the exception of surveyed roadways or road allowances, which require a distance of 40 m), and

   b) 100 m away from an occupied residence.

3) Flare spacing must comply with the requirements defined in the current Forest and Prairie Protection Regulations (at the date of this guide, *AR 135/72*).

4) Licensees must maintain areas surrounding flares clear of combustible debris to minimize fire hazards.

5) The EUB recommends that licensees comply with the Forest and Prairie Protection Regulations in unforested areas where there is a fire hazard associated with flare stack operation.

6) In certain circumstances, the EUB may consider variances in flare and incinerator spacing requirements. Licensees must contact the EUB Field Centre or the Operations Group for details.

   a) The EUB discourages variance requests for new facilities.

   b) Existing well-site equipment flare spacing waivers in effect prior to the effective date of this guide are maintained.

c) Licensees requesting a flare spacing variance must first consult relevant codes and engineering practices and provide related information in support of the variance request.

7.10 Compliance with Fire Bans

Information on fire bans can be obtained from Alberta Environment's Web site at <http://envweb.env.gov.ab.ca/env/forests/fpd/>, by telephone at (780) 427-fire[3473], or from local municipal districts.

1) Licensees must comply with fire bans with respect to flaring and incinerating operations.

7.11 Noise

1) Flares, incinerators, and enclosed burners must be designed to operate in compliance with *Guide 38: Noise Control Directive User Guide*. Routine and emergency flare conditions must be considered in noise impact assessments.

7.12 Portable Flare and Incinerator Units

1) Portable flare and incinerator units must comply with requirements listed in this guide, including liquid separation requirements in Section 7.7, backflash controls in Section 7.8, and equipment spacing requirements in Section 7.9.

2) Interconnecting lines must be secured to prevent whipping or flailing.

3) Portable flare and incinerator systems must be designed and approved by a qualified professional engineer.

   a) Installation drawings, operating procedures, and limiting operating conditions must be provided to users of the equipment.

   b) Approved design drawings and operating procedures must be provided to the EUB upon request.

4) Portable flare units must not be installed or operated in situations where conditions will exceed specified design limits.

7.13 Supplemental Requirements for Incinerators and Enclosed Burners

1) Incinerators and enclosed burners must be designed to operate with

   a) no visible flame,

   b) no black smoke,

   c) no H_2S odours, and

   d) acceptable noise levels.

2) Licensees must ensure that operating procedures that define the operational limits of incinerators or enclosed burners are documented and implemented.

   a) Operating limits and procedures must be provided to the EUB upon request.

   b) Incinerators and enclosed burners must be operated within ranges specified by the manufacturer or design engineer.

   c) Enclosed burner devices must be designed and operated to prevent flames outside the structure (e.g., flames from secondary air ports under high wind conditions).

   d) Sour gas incinerators and enclosed burners must be operated to maintain stack exit conditions necessary for adequate dispersion of SO_2 (see Section 7.15).

3) Incinerators must be equipped with

   a) reliable pilot and igniter,

   b) flame failure detection and alarm, and

   c) stack temperature monitor.

4) Incinerator stack top temperature must not be less than 600°C as a one-hour average.

5) Incinerators and enclosed burner devices must comply with the liquid separation (Section 7.7), spacing (Section 7.9), and noise (Section 7.11) requirements of this guide.

7.14 Flare Pits

The EUB encourages licensees to phase out flare pits used for routine gas flaring.

Flare pits must not be used at any facilities constructed after July 1, 1996. For facilities constructed prior to July 1996, flaring in pits is allowed, provided that the following requirements are met:

1) There must be no potential for produced liquids to enter the pit, consistent with the requirements of *IL 96-04: EUB Policy Update and Clarification on the Use of Earthen Pits*. The only limited exception to this requirement applies to flare pits designed for emergency blowdown.

2) Flaring of sour gas must comply with Alberta Ambient Air Quality Guidelines.

3) Gas containing more than 10 mol/kmol H_2S must not be flared in pits.

4) Licensees must conduct evaluations of solution gas flares for flare pits as described in Section 2 and implement the resulting decision.

5) Access restrictions and procedures must be in place in areas around flare pits where ground-level radiant heat intensity at maximum flare rates will exceed 4.73 kW/m^2.

6) Licensees must meet the requirements of the current Forest and Prairie Protection Regulations (at the effective date of this guide, *AR 135/72*):

   a) Areas within 30 m of flare pits must be cleared of all combustible debris.

   b) Clear, bare mineral soil surface must be maintained within 8 m of flare pits.

7.15 Dispersion Modelling Requirements for Sour and Acid Gas Combustion

SO_2 and H_2S emissions from flaring, incinerating, and combustion of sour and acid gas have the potential for adverse effects. Therefore, the design and operation of stacks must consider air quality impacts of sulphur emissions from the stacks and other sulphur emission sources in the area.

These requirements apply to combustion of sour gas in process equipment such as steam generators and process heaters, as well as to flares and incinerators.

1) Licensees must demonstrate that SO_2 and H_2S emissions from flaring, incinerating, and combusting of sour and acid gas will not result in exceedance of Alberta Ambient Air Quality Guidelines using dispersion modelling methods accepted by Alberta Environment (*1018-F:Air Quality Model Guideline)* if the gas contains more than or equal to

   - 10 mol/kmol H_2S, and/or
   - one tonne per day of sulphur.

   Licensees flaring gas below the above emission rates are encouraged to consider dispersion modelling as part of environmental due diligence. Facilities requiring Alberta Environment approval may require more detailed evaluation. Licensees should consult Alberta Environment directly in these instances.

2) Dispersion modelling must be completed by qualified technical personnel using computer models and methodologies acceptable to Alberta Environment or, if appropriate, as described in Section 3.5.

7.15.1 Modelling Assumptions

The definition for each of the dispersion modelling assessment types, screening and refined, are given in Appendix 2.

1) An appropriate model must be selected, and this choice must be defensible.

2) The applicant must demonstrate that the modelling follows accepted methodologies and standards.

7.15.2 Individual Source Modelling Approach

1) Initial modelling may be conducted using a screening assessment.

2) For a screening assessment, ambient air quality modelling must use the following:

   a) stack-specific terrain extracted from 1:50 000 topographical maps or equivalent;

   b) full meteorology;

   c) rural dispersion conditions;

   d) radiant heat loss of 25%; and

   e) a partial flare conversion of H_2S to SO_2 of 98% (i.e., 100 moles of H_2S yields 98 moles of SO_2 plus 2 moles of H_2S) in the determination of flare heat release rates—that is, the calculation must assume that only 98% of the available flare combustion energy is released as heat; this assumption can be increased to 100% if incinerators are used.

3) Modelling must address maximum hourly flow rate conditions, as well as routine gas combustion rates.

4) Complex terrain modelling assumptions must be used unless terrain elevations are less than the parallel airflow terrain criteria (see Appendix 8), in which case simple terrain modelling assumptions can be applied.

5) The selected flare or incinerator design must not result in ground-level SO_2 or H_2S concentrations in excess of the Alberta Ambient Air Quality Guidelines.

   a) A refined assessment can be used if the screening assessment results in an impractical stack height.

   b) Where it is not practical to design flares or incinerators of sufficient height for adequate dispersion, licensees may consider

      i) addition of fuel gas to increase heat release and plume rise, and

      ii) operating procedures and process controls to prevent emission rates or durations that would exceed the guidelines (see Sections 3.5.2 and 7.6).

   c) The EUB low-risk criteria discussed in Section 3.5 are *not* applicable to routine sour gas combustion at permanent facilities.

6) If the predicted maximum hourly average ground-level concentrations using the screening model are less than one-third of any of the related Alberta Ambient Air Quality Guidelines, then assessment of cumulative effects of all SO_2 sources is not mandatory unless required by an environmental impact assessment terms of reference.

7.15.3 SO_2 Cumulative Emissions Assessment

Licensees must account for SO_2 emissions from other sources that in combination with the proposed source could result in exceedances of the Alberta Ambient Air Quality Guidelines.

1) Licensees must evaluate the combined effects of other continuous SO_2 sources in the area if individual source model predictions exceed one-third of the one-hour Alberta Ambient Air Quality Guidelines for SO_2.

2) The following steps must be followed for cumulative emissions assessments:

   a) Identify the farthest downwind location where predictions exceed one-third of the hourly average Alberta Ambient Air Quality Guidelines for SO_2 to define the radius of influence.

   b) Identify all other continuous sources of SO_2 located within this radius of influence up to a maximum of 20 km; if there are no other sources of SO_2 within the radius, no further modelling is required.

   c) Quantify the emissions of SO_2 from these other sources and obtain all necessary input data, such as stack height and other parameters (the EUB expects licensees to share related data on a timely basis). Maximum hourly flare flow rate conditions must be used for all sources in the radius of influence.

   d) Model the cumulative effect of the multiple SO_2 emission sources.

   e) If the sum exceeds the Alberta Ambient Air Quality Guidelines, determine the appropriate stack heights required to meet the guidelines. All refined modelling must follow the methods outlined in Alberta Environment's *Air Quality Model Guideline: 1018-F*.

8 Venting and Fugitive Emissions Management Requirements

The EUB expects licensees to be diligent in controlling venting and fugitive emissions. Generally, venting is an unacceptable alternative to conservation or flaring. However, where those options are not practical, venting is allowed.

8.1 General Requirements

For the purposes of this section, vented gas excludes fugitive emissions from piping and equipment leaks.

1) Vented gas from continuous sources must be conserved if it is economic to do so using the evaluation in Section 2.7.

2) Gas must be burned if volumes are sufficient to support stable combustion.

   a) The EUB recommends that licensees conserve or burn gas at sites where routine vent volumes are greater than 0.5 10^3 m^3/day.

3) Vented gas must not constitute an unacceptable fire or explosion hazard on or off the facility lease.

   a) Sources of vented combustible gas must be adequately separated from ignition sources so as not to create a fire or explosion hazard.

   b) Hydrocarbon storage tank vents must be not less than 50 m from ignition sources.

4) An appropriate flame arrester or equivalent safety device must be used on all vent lines from oil storage tanks connected to flare stacks (see Oil and Gas Conservation Regulations 8.090[7]).

5) The discharge of PSVs where the gas may contain more than 10 mol/kmol H_2S must be connected to a flare system.

6) The EUB recommends that the discharge of PSVs, where the gas may contain less than 10 mol/kmol H_2S, be connected to flare systems where such systems are installed.

7) Equipment blowdown systems, including compressor stations, where the gas may contain more than 10 mol/kmol H_2S must be connected to a flare system.

8) The EUB recommends that equipment blowdown systems, where the gas may contain less than 10 mol/kmol H_2S, be connected to flare systems where such systems are installed.

9) Connection of pressure relieving devices at oil production batteries to open tanks ("pop tanks") is permitted according to Oil And Gas Conservation Regulations 8.031.

8.2 Limitations on Venting Gas Containing H_2S or Other Odorous Compounds

1) Venting of gas containing H_2S to the atmosphere must not result in an exceedance of the Alberta Ambient Air Quality Guidelines for H_2S.

2) Gas containing more than 10 mol/kmol H_2S must not be vented to the atmosphere.

   a) Oil and Gas Conservation Regulations 7.070 requires that stock tank vapours and other gas emissions from batteries receiving gas or having vapours containing more than 10 mol/kmol H_2S (1%) must be burned.

3) Any venting of gas containing H_2S and other reduced sulphur compounds must not result in odours outside the lease boundary.

   a) Appendix 14: H_2S Odour Management Process explains the response to off-lease odours.

8.3 Limitations on Venting Gas Containing Benzene

1) Vented gas from gas dehydrators is subject to limitations on benzene emissions, as detailed in *IL 2001-07: Revised Program to Reduce Benzene Emissions from Glycol Dehydrators*.

2) If licensees expect the benzene content of vented gas to exceed 5 mol/kmol, emissions must be assessed and controlled so that total benzene emissions for the facility or lease site do not exceed

   a) 3 tonnes/year for facilities commissioned prior to January 1, 1999, and located within 0.75 km of a residence (effective January 1, 2001); or

   b) 5 tonnes/year for facilities commissioned prior to June 1999 (effective January 1, 2001).

8.4 Fugitive Emissions Management

1) The EUB recommends that licensees consider the *Environmental Guideline for the Reduction of Volatile Organic Compound Emissions from Above Ground Storage Tanks* (Canadian Council of Ministers of the Environment, 1995) for the design and operation of fugitive emissions controls for storage tanks.

2) The EUB recommends that licensees develop and implement leak detection and repair programs to minimize fugitive emissions from upstream petroleum industry facilities.

   a) The EUB recommends that licensees periodically assess fugitive emission losses from facilities and use that information to define priorities for leak repair programs.

   b) The EUB may require licensees to conduct fugitive emissions assessments and may require licensees to implement appropriate control measures if

fugitive emissions or odours from the licensee's facilities are noted during inspection.

c) The true vapour pressure of hydrocarbon products stored in atmospheric storage tanks at gas plants must not exceed a true vapour pressure of 83 kilopascals (kPa) at 21.1°C where such tanks are vented to the atmosphere.

3) Licensees must use pressurized tank trucks or trucks with suitable emission controls to prevent odorous emissions from transport of sour water or hydrocarbon liquids from upstream petroleum industry facilities.

8.5 Limitations on Venting in Heavy Oil/Oil Sands Operations

1) *ID 91-03: Heavy Oil/Oil Sands Operations* defines gas venting requirements if the maximum potential H_2S release rate is equal to or greater than 0.04 m^3/hour. In such cases, Oil and Gas Conservation Regulations 7.060 and 7.070 and Oil Sands Conservation Regulations, Sections 6 and 7, apply with respect to requirements for burning of vented gas.

a) The release rate criterion is based on cumulative vent gas emissions from continuous sources on the operating site or lease. The release rate limitation includes emissions from hydrocarbon/produced water storage tanks and other heavy oil/oil sands production facilities.

b) Vent gas consisting primarily of water vapour emitted from secondary water treatment facilities or storage devices (e.g., hot lime softeners and boiler feed water tanks) may be excluded from these requirements.

c) In situations where some H_2S may be present in vent vapour, licensees must design stacks so that ground-level H_2S concentrations comply with the Alberta Ambient Air Quality Guidelines and must mitigate such H_2S releases if related emissions are shown to be the source of off-lease odours (see Appendix 14).

d) Licensees must ensure that infrequent venting from leaks or periodic venting for maintenance depressurizing and emergency shutdowns can be done safely. Venting of this type is not to be considered in determining the potential H_2S release rate.

8.6 Limitations and Guidelines for Well Test and Maintenance Venting

The EUB recognizes that venting has been and continues to be a routine industry practice for certain types of gas wells for testing and/or maintenance purposes.

1) Venting is not permitted within 500 m of a residence unless consented to by the resident and approved by the EUB Field Centre.

2) Licensees must burn all significant volumes of gas if volumes and flow rates are sufficient to support stable combustion. If gas cannot be burned, it may be vented under the following conditions:

a) Planned procedures and locations must be reviewed with the appropriate EUB Field Centre prior to the initiation of well test or maintenance programs involving venting.

b) The EUB Field Centre will consider proposed volumes to be vented, gas composition, and proximity to residents and public areas in determining the acceptability of the proposed venting.

c) Depending on local situations, the EUB Field Centre may impose more restrictive conditions on well venting or may not allow the practice.

3) Licensees must limit well test and maintenance venting to sweet, shallow gas well operations.

a) Venting is restricted to well tests and maintenance programs.

b) The gas must be sweet and contain essentially methane; the gas must not contain free hydrocarbon liquids.

4) Duration and volume guidelines for well test or maintenance venting are as follows:

a) Duration should not exceed 12 hours for each event, including cleanup.

b) Total volume should not exceed 15 10^3 m^3/month.

c) Approval must be obtained for higher volumes.

5) Where free water is present in the produced fluids, it must be separated and contained so it does not contaminate surrounding vegetation, surface water bodies, and soils. *ID 2001-09: Revision of Guide 55: Storage Requirements for the Upstream Petroleum Industry* details limitations regarding the release of produced water.

6) Gas must be vented safely away from potential ignition sources.

8.7 Venting of Noncombustible Gas Mixtures

Release of inert gases such as nitrogen and carbon dioxide (CO_2) from upstream petroleum industry equipment or produced from wells may not have sufficient heating value to support combustion. These gases can be vented to atmosphere subject to the following requirement.

1) Noncombustible gas mixtures containing odorous compounds including H_2S must not be vented to the atmosphere if off-lease odours may result. Alternatives to venting such gas include flaring or incinerating with sufficient fuel gas to ensure destruction of odourous compounds.

8.8 Coalbed Methane Venting

Licensees may vent gas as part of the evaluation of coalbed methane developments and technologies. The EUB views coalbed methane as a form of gas production; therefore related regulations apply.

1) Gas from coalbed methane tests must be burned if volumes are sufficient to support combustion.

2) Licensees must evaluate whether it is economic to conserve gas from longer-term coalbed methane tests (see Section 2.7).

3) Venting from coalbed methane tests and operations must comply with Sections 8.1, 8.2, 8.6, and 8.7, although Section 8.6, item (4), does not apply.

4) Free water must be appropriately stored and disposed of.

9 Sulphur Recovery Requirements and Sour Gas Combustion

Certain types of oil production, gas gathering, and nonassociated gas battery facilities can have significant sulphur emissions originating from combustion of sour solution gas, low-pressure-produced water flash-gas, and flaring of glycol dehydrator vent gas. The EUB expects appropriate pollution prevention measures to be implemented in such situations to minimize sulphur emissions associated with combustion of sour or acid gas.

1) Sulphur recovery guidelines set out in *ID 2001-03* apply to sour gas plants and other upstream petroleum facilities, such as oil production batteries, gas batteries, and pipeline facilities.

   a) Where total sulphur emissions from all sources, including equipment that use sour gas as fuel, on an operating site exceed 1.0 tonne/day, the sulphur recovery requirements as set out in Table 1 of *ID 2001-03* apply.

9.1 Sulphur Recovery Exemption at Solution Gas Conservation Facilities

The EUB may waive sulphur recovery requirements to encourage the clustering of solution gas.

1) Solution gas conservation clustering schemes that have a total inlet sulphur of between 1 and 5 tonnes/day will be considered for flexibility by Alberta Environment and the EUB in the application of *ID 2001-03*.

2) Licensees must specifically apply for a waiver of the sulphur recovery guidelines as part of related production project applications submitted to the EUB.

3) Applicants must demonstrate that implementation of sulphur recovery would make conservation of produced gas uneconomic using the methodology defined in Section 2.7.

   a) If solution gas conservation with sulphur recovery is economic, licensees must implement sulphur recovery.

4) Applicants must demonstrate that conservation revenues and cost estimates are reasonable.

   a) Capital cost estimates for sulphur recovery must be based on appropriate technologies. Operators must identify cost-effective processes suited to the facilities in question. Proven approaches applicable to high-pressure, highly sour gas (such as amine sweetening with Claus conversion of H_2S to sulphur) are likely not reasonable choices for low-pressure, low-H_2S-content solution gas.

   b) Information on the following must be available to the EUB upon request:

      i) volumes of gas available for conservation, including assessment of clustering other sour solution gas sources in the area;

ii) incremental energy (fuel gas) requirements for solution gas compression and processing related to gas sweetening;

iii) incremental energy (fuel gas) requirements for sulphur recovery processes;

iv) H_2S concentration of conserved gas, along with expected average sulphur emissions and/or variability of sulphur emissions; and

v) information on technology selection and costs for conservation equipment (compression), gas gathering systems, and sulphur recovery processes. Note that since the economic evaluation is based on incremental costs of gas conservation, equipment costs related to oil production, processing, and transportation must not be included.

5) Licensees must consult stakeholders in the area, as required by *Guide 56*, specifically explaining that a waiver of the sulphur recovery guidelines is being applied for. Any related objections must be disclosed in related facility applications.

6) The EUB and Alberta Environment will consider the scope of the production project, duration of the sulphur emissions, and views of the local public in making decisions on applying the sulphur recovery guidelines.

a) The existing processes used for Environmental Protection and Enhancement Act approvals (for sour gas processing plants) and EUB approvals will be used to measure public acceptance of any proposals. If there are no unacceptable impacts and nearby residents agree, meeting the sulphur recovery guidelines may not be required for solution gas facilities.

b) The EUB does not allow multiple nonsulphur recovery sour operating sites in close proximity where it is practical to consolidate the facilities in one location and install sulphur recovery.

i) Sour gas facility proliferation guidelines in *ID 2001-03*, Section 6, provide guidance on how the EUB will assess this matter.

7) The waiver is not applicable to sour gas production and processing facilities handling nonassociated gas.

10 Measurement and Reporting

EUB measurement and accuracy requirements, as well as requirements for determining gas properties (e.g., density, composition, and heating value), are provided in the following publications: *Guide 56,* Appendices, *Guide 7, Guide 49: Gas Density Measurement Frequency, Guide 64:Facility Inspection Manual,* the draft Measurement Guide, and the Oil and Gas Conservation Regulations.

1) Licensees of oil, bitumen, and natural gas production and processing facilities (including well tests) must report volumes of gas greater than 0.1 10^3 m^3/month (adjusted to 101.325 kPa and 15°C) that is flared, incinerated, or vented on the appropriate EUB production submissions. This includes reporting all emissions from routine operations, emergency conditions, and the depressurizing of pipeline, compression, and processing systems.

2) Operators must be able to demonstrate that volumes of gas are accurately and consistently captured (see Section 10.2).

3) If production submissions are not routinely submitted for a facility, as is sometimes the case for well completions, and if total volumes are not significant (less than 0.5 10^3 m^3 in total), the EUB will waive the reporting requirement.

4) The EUB recommends that flared, incinerated, and vented gas be metered with equipment suited to the source flow conditions. However, accurate engineering estimates may be accepted where meters are not practical and the measurement accuracy requirements can be met.

5) Flared and vented gas measurement systems must comply with EUB requirements as summarized in *Guide 56*, Appendices, which lists related interim directives, informational letters, and guides.

6) Measurement accuracy standards defined in *Guide 64* and the Oil and Gas Conservation Regulations, Schedule 9, apply to flaring, incinerating, and venting at pipeline and gas processing facilities.

   a) Meters and/or estimating procedures must be designed to suit expected flow conditions for the flare or vent sources listed below:

      i) routine flare and vent sources at conventional oil and gas production and processing facilities where annual average flared and vented volumes exceed 0.5 10^3 m^3/day; and

      ii) solution gas flared and vented from heavy oil or bitumen production facilities within designated oil sands areas where annual average flared and vented volumes exceed 2.0 10^3 m^3/day, based on general metering requirements specified in *IL 91-09: Exemption from Gas Measurement Crude Oil/Bitumen Wells.*

b) If licensees can demonstrate that flows can be consistently and accurately estimated from other data, the EUB may accept estimated measurements (see Section 10.2).

c) The EUB will require licensees to install total flare gas measurement in locations where measurement accuracy standards are not met.

7) Meters designed to suit expected flow conditions must be used to measure the following flare streams:

a) acid gas flared, either continuously or in emergencies, from gas sweetening systems regardless of volume; and

b) fuel gas added to acid gas to meet minimum acid gas heating value requirements.

8) The EUB recommends that licensees meter total flare streams in larger oil and gas batteries, pipeline facilities, and gas processing plants where there are multiple connections to the flare system from sources such as storage tank vents, pressure-relieving valves, manual blowdowns, and emergency vent valves.

9) If all solution gas is flared or vented from conventional or heavy oil production facilities, produced gas measurements (less measured fuel gas use) may be used to report volumes flared or vented. In such situations, specific flare or vent gas meters are not required.

10) Licensees must be able to provide the volume of fuel gas used for flare pilots and flare header purge gas; this information must be provided to the EUB upon request.

a) Fuel gas used in flare systems (including fuel gas make-up to acid gas flares) is to be reported as part of the total fuel gas number on EUB production statements.

b) Fuel gas added to flare systems must be subtracted from the reported flare volumes if total flare gas measurement is used.

10.1 Metering Requirements and Guidelines

1) The following guidelines address minimum requirements for flared, incinerated, and vented gas measurement equipment:

a) Gas temperature, static pressure, and differential pressure must be recorded if differential meters (e.g., orifice meters, pitot tubes, annubars) are used.

b) Flared and vented gas composition must be determined by analysis or engineering estimate and incorporated into meter factor calculations as appropriate.

c) Measurement equipment, installation, and calculations must be consistent with the applicable manufacturer, American Gas Association, and Canadian Standards Association standards and guidelines.

2) The EUB recommends that licensees consider high turndown ratio measurement technology, such as electronic mass flow meters, for measurement in emergency flare headers.

10.2 Estimating Requirements

If it is not practical to meter flared, incinerated, or vented gas and accuracy requirements can be met, the EUB will accept estimates of gas usage.

1) Licensees must be able to demonstrate that a reliable and accurate flared, incinerated, or vented gas estimating and reporting system is in place and consistently used (see CAPP's *Guide for Estimation of Flaring, Incinerating, and Venting Volumes*, 2002). Flared, incinerated, and vented gas estimating procedures and systems must include the following:

   a) Estimating systems must account for all gas flared, incinerated, and vented from the facility (expressed to the nearest 0.1 10^3 m^3/month) during routine, emergency, and maintenance operations, well testing, and the depressurizing of vessels, compressors, and pipelines.

   b) Estimates must be based on calculations that account for the volume, gas composition, temperature, and initial and final pressures of the system.

   c) Procedures for estimating vented and flared volumes must be developed by a qualified technical person.

   d) If smaller reportable flared volumes are not measured by existing flare meters, a formal system for consistently estimating and reporting these volumes must be in place.

2) Licensees must produce documentation describing flared and vented gas estimating and reporting procedures, as well as related operating logs, for review by the EUB upon request.

3) For heavy oil/oil sands operations estimating requirements, see *ID 91-03: Heavy Oil/Oil Sands Operations* and *Clarifications*.

10.3 Treatment of Gas Well Production Delivered to Oil Batteries

1) Licensees must apply to the EUB Operations Group for approval to connect a gas well to an oil battery unless the total associated gas volumes are

   a) less than 0.5 10^3 m^3/day;

   b) less than 16.9 10^3 m^3/day but greater than 0.5 10^3 m^3/day and the ratio of gas well gas to total gas delivered from the battery is less than 0.65; or

c) greater than 16.9 10^3 m^3/day and the ratio of gas well gas to the total gas delivered from the battery is less than 0.35.

2) Licensees must obtain a new battery code and submit a separate set of production statements for the gas well(s)/battery showing delivery of its gas volume to the oil battery to allow for the clear differentiation between solution gas and gas well gas.

a) The reporting of gas well production data as part of oil battery production statements will no longer be allowed.

3) Licensees must have written approval from the EUB Operations Group to tie into an oil battery.

10.4 Flared, Incinerated, and Vented Gas Reporting

1) All flared, incinerated, and vented gas must be reported as described in EUB *Guide 7*.

2) Gas must be reported separately as flared, incinerated, or vented for each facility. That is, gas actually flared or vented at a downstream facility (e.g., a gas processing plant) must not be allocated to an upstream facility (e.g., a battery) and reported for that upstream facility.

a) If the location of flaring, incinerating, or venting is not at a licensed facility (e.g., compressor, pig traps, or pipelines) flaring, incinerating, and venting must be reported at the closest upstream licensed facility (including wells).

3) Licensees must report flared, incinerated, and vented volumes under the correct battery type.

10.5 Flaring, Incinerating, and Venting Records (Logs)

1) In addition to the required reporting to the Petroleum Registry, records must be maintained for all reportable flaring, incinerating, and venting events that exceed time and volume limits or that may result in public concern. For gas plants, logs must indicate which events are considered major nonroutine, as defined in Section 5.3.

2) Licensees must respond to public complaints and maintain a log of flaring, incinerating, and venting events in order to comply with release reporting requirements and to maintain proper records.

a) Release reporting requirements are defined in *IL 98-01* and Alberta Environment's *Release Reporting Guideline*.

b) Logs must include information on complaints related to flaring, incinerating, and venting events and how these complaints were investigated and addressed.

c) Logs must describe each nonroutine flaring, incinerating, and venting incident and any changes implemented to prevent future nonroutine events of a similar nature from occurring in the future.

d) Logs must include the date, time, duration, gas source or type (i.e., sour inlet gas, acid gas), and volumes for each incident.

3) Flaring records must be made available to the EUB upon request for each production facility, pipeline, and gas processing facilities where flaring occurs.

a) Licensees may retain logs for remote or semi-attended facilities at a central location (e.g., the licensee regional office) where public complaints related to the facility in question would normally be received.

4) In situations governed by flaring permits, a Sour Gas Flaring Data Summary Report (Appendix 12) must be completed in full and submitted to the EUB Operations Group within three weeks of the flaring completion date.

11 Industry Performance Reporting

A summary of flaring, incinerating, and venting emission details is compiled annually and is available as Statistical Series *ST-60B: Upstream Petroleum Industry Flaring Report* on the EUB Web site <www.eub.gov.ab.ca>.

As recommended by CASA, the EUB is investigating the feasibility of making available a summary of information on flaring, incinerating, and venting at gas gathering systems and gas batteries that would include

- flare distribution by volume for gas gathering systems and gas batteries;
- gas flaring, incinerating, and venting volumes across Alberta;
- odour complaint distribution across Alberta; and
- summary data on flare notifications.

As also recommended by CASA, the EUB is investigating the feasibility of making available a summary of nonconfidential information on well test flaring data that may include the following:

- total volume flared for completion and testing of wells;
- total sulphur emitted from completion and testing of wells;
- number of wells tested; and
- total volume flared.

12 Compliance and Enforcement

The EUB's enforcement process is specified in *IL 99-04 plus Clarification: EUB Enforcement Process, Generic Enforcement Ladder and Field Surveillance Enforcement Ladder Plus Clarification.*

Noncompliance with *Guide 60* found during audits or inspections will be applied through the following audit/inspection categories and associated EUB guides:

- Drilling – *Guide 36: Drilling Rig Inspection Manual*
- Servicing – *Guide 37: Service Rig Inspection Manual*
- Waste Facilities – *Guide 63: Oilfield Waste Management Facility*
- Oil Facilities – *Guide 64: Facility Inspection Manual*
- Gas Facilities – *Guide 64: Facility Inspection Manual*
- Lease (Wells) – *Guide 64: Facility Inspection Manual*
- Pipelines – *Guide 66: Pipeline Inspection Manual*

12.1 Unsatisfactory Items

Table 4 gives the consequence and infraction description of noncompliance for flaring, incinerating, and venting rated as

- Minor unsatisfactory event/inspection (**U**)—a contravention of regulation(s) or requirement(s) that does not result in a direct threat to the public or the environment and does not adversely affect oil and gas operations.
- Major unsatisfactory event/inspection (**M**)—a contravention of regulation(s) or requirement(s) that an operator has failed to address or that has the potential to cause an adverse impact on the public or the environment.
- Serious unsatisfactory event/inspection (**S**)—a contravention of regulation(s) or requirement(s) combined with a demonstrated disregard for the regulation(s)/ requirement(s) or fraudulent activities.

The EUB reserves the right to enforce and/or escalate noncompliance issue(s) to any level should conditions warrant.

Table 4. Unsatisfactory Items

DECISION TREE PROCESS		
Consequence	**Infraction**	***Guide 60* Reference**
M	Decision tree process not completed for new, existing, and temporary flares and vents as required	Sections 2.3, 3.1, 4.1, 5.1, 6.1
M	Failure to implement economic decision tree conservation projects/performance requirements	Sections 2.4, 2.7, 3.1, 4.1, 5.1, 6.1, 8.1, 9.1

PERMITS/APPROVALS		
Consequence	**Infraction**	***Guide 60* Reference**
M	Failure to comply with any condition of permit or approval (well test permits, volume exceedance approvals, and blanket permits)	Sections 3, 7.6, Appendices 5, 6, 7

NOTIFICATION and CONSULTATION		
Consequence	**Infraction**	***Guide 60* Reference**
M	Incomplete public notification and/or consultation	Sections 2.8, 3.8, 4.2, 5.4, 6.4
S	No attempt to comply with notification and/or consultation	Section 3.8
U	Failure to notify the EUB Field Centre of flaring events as required	Sections 2.8, 3.8, 4.2, 5.4, 6.4, Appendix 11
M	Public information packages not as per requirements	Section 2.8.1
S	Failure to notify the EUB of any unresolved public concerns regarding permitted sites	Sections 2.9, 3.4.1, 3.8

VOLUME/DURATION EXCEEDANCES		
Consequence	**Infraction**	***Guide 60* Reference**
M	Flaring solution gas from an oil/bitumen well with a GOR greater than 3000 m^3/m^3	Section 2.4
M	Flaring solution gas from a new oil or bitumen well greater than 300 10^3 m^3/month/well during any month of the NOWPP	Section 2.4.1
M	Flaring longer than 30 days at a new oil/bitumen well located within 3 km of a conserving facility	Section 2.4.1
M	Noncompliance with flare reduction requirements during planned shutdowns and emergency events	Sections 2.10, 7.6
M	Exceeding the allowable annual flare volumes at a gas plant	Section 5.2
M	Exceeding the major flaring events criteria for gas plants (6-in-6)	Section 5.3
M	Failure to submit an exceedance report within 30 days (6-in-6)	Section 5.3
U	Failure to investigate nonroutine flaring or venting events	Section 5.3
U	A significant volume of gas is being vented, not burned (>500 m^3/d)	Sections 5.3, 8.1

(continued)

Table 4. Unsatisfactory Items (continued)

VISIBLE EMISSIONS		
Consequence	**Infraction**	***Guide 60* Reference**
M	Black smoke from nonroutine or emergency flaring events exceeds an average of 40% opacity over 6 consecutive minutes	Section 7.2
M	Routine combustion of gases results in continuous or repeat visible black smoke	Section 7.2

H_2S GAS		
Consequence	**Infraction**	***Guide 60* Reference**
S	Flaring or incinerating sour gas containing more than 50 mol/kmol H_2S or from a critical sour gas well without the required permit	Sections 3.2.2, 3.6, 6.2
M	Failure to comply with conditions for flaring or incinerating small volumes of sour gas containing more than 50 mol/kmol H_2S when a permit is not required	Section 3.2.2
M	Failure to discontinue flaring or incinerating sour gas during well test or at a gas plant when Alberta Ambient Air Quality Guidelines have been exceeded	Sections 3.2.2, 3.5
U	Failure to conduct dispersion modelling for flares greater than 10 mol/kmol H_2S where required	Section 3.5
M	Any off-lease H_2S odours	Sections 7.1, 7.13

FACILITY DESIGN		
Consequence	**Infraction**	***Guide 60* Reference**
U	Failure to have an adequate knockout drum or flare separator	Sections 7.3, 7.4, 7.5
M	No flare stack where one is required	Section 5.2
U	Flare stack height does not conform to *Guide 60* requirements	Section 7.5
M	Sour pressure relief valves not tied into flare systems where required	Section 8.1
M	No flame arrester between tank and flare stack where required	Section 8.1
M	Pilot/ignition devices not available/operable (sour and acid gas flares)	Section 7.4
M	Insufficient fuel gas available make-up to acid/sour gas flare	Section 7.3
M	No high-level alarm on knockout drum/flare separator where required	Section 7.7
M	Operating procedures and/or automatic shutdowns not in place to control major sour/acid gas flaring events	Section 7.6
M	Extinguishing of a sour gas flare pilot without approval	Section 7.4.1
M	Portable flare/incinerator units not designed and approved by a qualified, professional engineer	Section 7.12
M	Portable flare/incinerator units not being operated within the specified design limits	Section 7.12
U	Failure to produce approved design drawings for portable flare/incinerator units upon EUB request	Section 7.12

(continued)

Table 4. Unsatisfactory Items (concluded)

SPACING		
Consequence	**Infraction**	***Guide 60* Reference**
U	Flare separator/knockout drum within 25 m of a flare, incinerator, or enclosed burner without EUB approval	Section 7.9
U	Noncompliance with flare and incinerator spacing requirements	Section 7.9
M	Flare stack is less than 100 m from an occupied residence	Section 7.9

MEASUREMENT and REPORTING		
Consequence	**Infraction**	***Guide 60* Reference**
U	Failure to keep flaring, incinerating, and venting logs as required	Section 10.5
U	Inadequate flare or vent measurement or estimating procedures	Sections 10.1, 10.2
M	Failure to measure and/or report acid gas	Section 10.5
M	Acid gas flare fuel make-up not measured	Section 10
U	Acid gas meter not equipped with a continuous temperature recorder	Section 10.1
U	Gas usage not reported or reported inaccurately to the EUB	Section 10
U	Reporting measured gas well production on an oil battery	Section 10.3
M	Reporting incorrect data on the EUB *Sour Gas Flaring Summary Report*	Section 10.5

Appendix 1: References and Contacts Cited

EUB Documents*

Guide 7: Production Accounting Handbook
Guide 28: Applications for Power Plants, Substations, and Transmission Lines
Guide 36: Drilling Rig Inspection Manual
Guide 37: Service Rig Inspection Manual
Guide 63: Oilfield Waste Management Facility
Guide 38: Noise Control Directive User Guide
Guide 40: Pressure and Deliverability Testing Oil and Gas Wells
Guide 49: Gas Density Measurement Frequency
Guide 52: Electronic Capture of Well Test Data and Updates
Guide 55: Storage Requirements for the Upstream Petroleum Industry
Guide 56: Energy Development Application Guide
Guide 64: Facility Inspection Manual
Guide 65: Resources Applications for Conventional Oil and Gas Reservoirs
Guide 66: Pipeline Inspection Manual

ID 91-03: Heavy Oil/Oil Sands Operations
ID 97-06: Sour Well Licencing and Drilling Requirments
ID 99-06: Upstream Petroleum Industry Flaring Requirements
ID 99-08: Noise Control Directive
ID 2001-03: Sulphur Recovery Guidelines for the Province of Alberta
ID 2001-09: Revision of Guide 55: Storage Requirements for the Upstream Petroleum Industry
ID 2002-01: Electronic Submission of Production, Disposition, and Transportation Volumetric Information and Well Status Changes

IL 91-09: Exemption from Gas Measurement Crude Oil/Bitumen Wells
IL 96-04: EUB Policy Update and Clarification on the Use of Earthen Pits
IL 98-01: A Memorandum of Understanding Between Alberta Environment and the Alberta Energy and Utilities Board Regarding Coordination of Release Notification Requirements and Subsequent Regulatory Response
IL 99-04 plus Clarification: EUB Enforcement Process, Generic Enforcement Ladder and Field Surveillance Enforcement Ladder plus Clarification
ID 2001-03: Sulphur Recovery Guidelines for the Province of Alberta
ID 2001-09: Revision of Guide 55: Storage Requirements for the Upstream Petroleum Industry
ID 2002-01: Electronic Submission of Production, Disposition, and Transportation Volumetric Information and Well Status Changes

IL 91-09: Exemption from Gas Measurement Crude Oil/Bitumen Wells
IL 96-04: EUB Policy Update and Clarification on the Use of Earthen Pits
IL 98-01: A Memorandum of Understanding Between Alberta Environment and the Alberta Energy and Utilities Board Regarding Coordination of Release Notification Requirements and Subsequent Regulatory Response
IL 99-04 with Clarifications: EUB Enforcement Process, Generic Enforcement Ladder and Field Surveillance Enforcement Ladder and Clarifications
IL 2001-01: Appropriate Dispute Resolution (ADR) Program and Guidelines for Energy Industry Disputes
IL 2001-07: Revised Program to Reduce Benzene Emissions from Glycol Dehydrators

ST-13A: Alberta Gas Plant Statistics Annual Report
ST-13B: Alberta Gas Plant Statistics Monthly Supplement
ST-60B: Upstream Petroleum Industry Flaring and Venting Report

Other Documents

Alberta Environment Documents

Alberta Ambient Air Quality Guidelines
Air Quality Model Guidelines 1018-F
Environmental Assessment (Mandatory and Exempt Activities) Regulation (Alberta Regulation 111/93)
Environmental Protection and Enhancement Act
Forest and Prairie Protection Regulations (AR 135/72)
Release Reporting Guideline 1028-F

Other Sources

AP-RP-521, Guide for Pressure-Relieving and Depressuring System, American Petroleum Institute, Recommended Practices
AR 293/94 Alberta Boilers and Pressure Vessels Regulations, Alberta Safety Codes Act, Alberta Boilers Safety Association
Gas Flaring, Incinerating, and Venting in Alberta, Report and Recommendations for the Upstream Petroleum Industry by the Flaring/Venting Project Team, CASA
GPSA Engineering Data Book (11th edition), Gas Processors Suppliers Association
Industry Recommended Practices for Well Testing and Fluid Handling, Volume 4, Petroleum Industry Training Service
Management of Routine Solution Gas Flaring in Alberta: Report and Recommendations of the Flaring Project Team, CASA

(continued)

* EUB documents are available on the EUB Web site <www.eub.gov.ab.ca> or from EUB Information Services, 640–5 Avenue SW, Main Floor, Calgary AB T2P 3G4; Tel: (403) 297-8190; Fax: (403) 297-7040.

Other Documents (continued)

Guide for Estimation of Flaring, Incinerating, and Venting Volumes, CAPP
Recommended Practices for Flaring of Associated and Solution Gas at Oil Production Facilities, CAPP
CERI Survey of Hydrocarbon Price Forecasts Utilized by Canadian Petroleum Consultants and Canadian Banks, Dobson Resource Management
CERI Electricity Price Forecast for the Alberta Integrated Electric System
Oil and Gas Conservation Regulations

EUB Contacts

Facilities Applications Group: (403) 297-4369
Production/Well Data Services: (403) 297-8952
Operations Group: Corporate Compliance: (403) 297-4485
Field Centres
- Bonnyville: (780) 826-5352
- Midnapore: (403) 297-8303
- Drayton Valley: (780) 542-5182
- Grande Prairie: (780) 538-5138
- Medicine Hat: (403) 527-3385
- Red Deer: (403) 340-5454
- St. Albert: (780) 460-3800
- Wainwright: (780) 842-7570

Field Suboffices
- Fort McMurray: (780) 743-7214
- High Level: (780) 926-5399

Appendix 2: Definitions as Used in *Guide 60*

Acid gas — Gas that contains (H_2S), total reduced sulphur compounds, and/or carbon dioxide (CO_2) that is separated in the treating of solution or nonassociated gas.

Adjacent — The distance within 1 km or less of the specified well, pipeline, or facility.

Associated gas — Gas that is produced from an oil or bitumen reservoir. This may apply to gas produced from a gas cap or in conjunction with oil or bitumen.

Clustering — Clustering is defined as the practice of gathering several solution gas flares or vents at a common point for conservation.

Combustion efficiency — The overall conversion of flared gas to products of complete combustion (i.e., CO_2, H_2O, and SO_2). For the purposes of this guide, combustion efficiency is normally reported as the percentage of carbon in the fuel that is converted to CO_2.

Conservation — The recovery of solution gas for use as fuel for production facilities, for other useful purposes (e.g., power generation), for sale, or for injection into an oil or gas pool.

Destruction efficiency — The relative destruction of flared gas compounds to products of complete and incomplete combustion. Destruction efficiency does not address complete combustion (see Combustion Efficiency). For the purposes of this guide, destruction efficiency is normally reported as 100 minus the percentage of fuel that remains after combustion.

Gas battery — A gas battery is a system or arrangement of surface equipment that receives (primarily) gas from one or more wells before it is delivered to a gas gathering system, market, or other disposition. Gas batteries may include equipment for measurement and for separating inlet streams into gas, hydrocarbon liquid, and/or water phases. Related production is required to be reported as defined in *Guide 7*.

Gas plant — A gas plant is defined in the Oil and Gas Conservation Regulations as "a plant for the extraction from gas of hydrogen sulphide, helium, ethane, natural gas liquids or other substances but does not include a well head separator, treater, or dehydrator."

Using this definition, any facility that includes an amine, or sweetening, process is a gas plant and must be approved both Alberta Environment and the EUB. Any sour gas plant that proposes to emit more than 2.8 tonnes/day of sulphur is a Mandatory Activity on Schedule 1 of the Environmental Assessment (Mandatory and Exempt Activities) Regulation (Alberta Regulation 111/93) and requires an environmental assessment as part of the approval process.

The EUB exempts from classification as gas processing plants those production facilities that recover less than 2 m^3/day hydrocarbon liquids with refrigeration or that remove small amounts of sulphur (less than 0.1 tonne/day) using nonregenerative scavenging chemicals that have no H_2S or SO_2 air emissions. For more detail, contact Alberta Environment.

Good neighbour notification — In situations when a licensee is not specifically required to notify public or other interested parties prior to flaring events, the EUB expects licensees to be a "good neighbour" by making special efforts to notify the public/interested parties about flaring events in any case.

Must — The word "must" in a requirement means that compliance is required and is subject to EUB enforcement.

Nonassociated gas Gas produced from a gas pool (i.e., not associated with oil or bitumen reservoirs or with production).

Objector A member of the public or any other interested party that has concerns/objections regarding a licensee's notification to flare based on the flare itself or the licensee's decision tree process and has formally notified the licensee and/or EUB in this regard.

Oil battery For the purposes of this guide, this is a system or arrangement of tanks or other surface equipment receiving primarily oil or bitumen from one or more wells before it is delivered to market or other disposition. An oil battery may include equipment for measurement and for separating inlet streams into oil, gas, and/or water phases. Related production is required to be reported as defined in *Guide 7*.

Recommended or Recommends The word "recommended" indicates that the procedure or practice described is a guideline to be used by the applicable party in meeting EUB requirements.

Refined assessment This is a more complex and data-intensive level of dispersion modelling. Refined assessments more closely estimate actual air quality impacts by using actual meteorological data.

Required The word "required" means that the specified action or item is a minimum regulatory requirement and is subject to EUB enforcement.

Screening assessment This is the quickest and simplest dispersion modelling approach. Screening assessments usually provide a conservative (worst-case) estimate of downwind concentrations. If exceedances of the Alberta Ambient Air Quality Guidelines are predicted by a screening assessment, a refined assessment may be necessary. Alternatively, stack design parameters may be modified until predicted ambient air quality meets the Alberta Ambient Air Quality Guidelines.

Solution gas For the purposes of this guide, solution gas is all gas that is separated from oil or bitumen production.

Sour gas Sour gas contains H_2S. Depending on H_2S concentrations, sour gas may pose a public safety hazard if released or may result in unacceptable off-lease odours if vented into the atmosphere.

Source All gas flared, incinerated, or vented from a single operating site, such as an oil battery or multiple-well pad.

Sulphur emissions For the purposes of this guide, this includes all air emissions of sulphur-containing compounds, including SO_2, H_2S, and total reduced sulphur compounds (e.g., mercaptans). Sulphur emissions from flare stacks are expected to be primarily in the form of SO_2, with minor amounts of other compounds.

Sweet gas Natural gas contains no or trace amounts of H_2S (less than 10 ppm H_2S).

Appendix 3: Abbreviations

10^6 m^3	million cubic metres
10^3 m^3	thousand cubic metres
AOF	absolute open flow
CAPP	Canadian Association of Petroleum Producers
CASA	Clean Air Strategic Alliance
CO_2	carbon dioxide
CSA	Canadian Standards Association
EPZ	emergency planning zone
ESDV	emergency shutdown valve
FIS	Field Information System
GOR	gas to oil ratio (gas:oil)
GPP	good production practice
H_2S	hydrogen sulphide
HLSD	high-level shutdown
km	kilometre
kPa	kilopascal
m/s	metre per second
mol/kmol	mole per kilomole
MJ	megajoule
MW	megawatt
NOWPP	New Oil Well Production Period
NPV	net present value
ppm	parts per million
PSV	pressure safety valve
SECAP	Sulphur Emission Control Assistance Program

Appendix 4: Background to *Guide 60*

Concerns about flaring prompted the EUB to support Alberta Research Council research on flaring. Findings reported in 1996 suggested that the efficiency of flare stacks in destroying waste gas was not as high as originally thought and that a variety of products of incomplete combustion were contained in flare emissions.

The EUB then consulted with stakeholders from industry, the public, and other government sectors and reviewed existing policies on solution gas conservation. CAPP brought the issue of flaring to the CASA Board of Directors in November 1996 and established the Flaring Project Team in February 1997 to develop recommendations to address potential and observed impacts associated with flaring. In its 1998 final report, *Management of Routine Solution Gas Flaring in Alberta: Report and Recommendations of the Flaring Project Team*, the Flaring Project Team recommended a framework for solution gas flaring management and a decision tree process for achieving flare reductions.

The EUB Implements the CASA Recommendations

In 1999, the EUB implemented the solution gas management framework (Section 2), the decision tree process (Section 2.3), and other CASA recommendations in the first edition of *Guide 60* (1999). The guide mandated firm, short-term solution gas flare reduction targets of 15% and 25% by the end of 2000 and 2001 respectively relative to the 1996 revised baseline of 1340 10^6 m^3 per year; the guide also defined maximum limits on the total volume of solution gas that could be flared at individual sites if voluntary targets were not met.

In 2000, a new CASA team, the Flaring/Venting Project Team, convened to review progress made on the 1998 recommendations, as well as make further recommendations on flaring, incinerating, and venting. The result was the 2002 report, *Gas Flaring, Incinerating, and Venting in Alberta: Report and Recommendations for Upstream Petroleum Industry by the Flaring/Venting Project Team*. The report states that the implementation of the solution gas management framework and the flare reduction targets by the upstream petroleum industry had successfully resulted in a 53% reduction in solution gas flares relative to the 1996 baseline. On the basis of that success, the Flaring/Venting Project Team recommended that a similar decision tree process be applied to solution gas venting, well test flaring, and facility flaring. In addition, the team recommended that a 50% reduction target be set for all solution gas flaring in Alberta relative to the 1996 baseline.

Work on further reducing flaring, incinerating, and venting continues.

Ongoing Research

The EUB supports the 2002 CASA recommendation for additional research so that Alberta can continue to move toward the use of practical flare combustion efficiency standards where flaring is necessary. The EUB expects that industry will support and participate in the funding of continued research focusing on

- the development of practical design correlations for predicting and field methods for measuring flare combustion efficiency;
- understanding the causes of reduced combustion efficiency, with the ultimate goal of defining operating limits for flares, as well as supporting the development of cost-effective technologies to improve flare combustion efficiency; and
- understanding the effects of brine, liquid hydrocarbons and hydrogen sulphide (H_2S) on the formation of undesirable products of incomplete combustion.

Appendix 5: Flaring/Incinerating Permit Application Requirements

All flaring/incinerating permit applications, including applications to exceed the routine flare volume allowance, must include all required information and attachments before the EUB will issue a permit. Field descriptions for the Flaring/Incinerating Permit Application Form as in Appendix 6 are given below.

See Section 3.2 for more details on situations that require and do not require permits.

1. Applicant Information

1) Licensee company name and Licensee contact name

2) Licensee phone no. and Licensee e-mail

3) Consultant information—If a consultant is preparing and submitting the flaring/incineration form on behalf of a licensee, enter the consultant company name, contact name, phone number, and e-mail address in the fields provided.

2. Well Details

4) Well name and Well licence no.

5) UWI (unique well identifier) and Surface location of the well

6) Type of well (gas or oil) and Well designation (critical or noncritical)

7) Zone that is to be completed and/or tested and Lahee classification of the well—Note: For Re-entry and Experimental wells, enter the Lahee classification of the well before it was reclassified or what the classification would have been had it not been classified as Experimental.

8) Well centre elevation and Max. terrain elev. within a 7 km radius of the well surface location

9) Proposed operation end date of the flaring/incineration event and the Stack height of the flare/incinerator

10) The maximum H_2S concentration to be used as a condition in the permit and the stack Exit diametre

11) The Total volume of gas to be flared/incinerated (including cleanup and testing) and the Total sulphur emissions. These will be listed as maximum conditions of the permit by the EUB.

12) The Maximum rate and Average (expected) rate for flaring/incinerating

13) The anticipated rates of Hydrocarbon liquid production and Water production

14) The Name of facility and Location where liquids from the well will be transported—Note that all liquids must be transported in trucks equipped with pressurized tanks if H_2S or other odorous or potentially hazardous reduced sulphur compounds are present.

3. Attachments

15) Attachments as described below:

   a) information on whether the well was or is tied in to production facilities. If in-line testing is planned, confirmation that the facilities are appropriately designed to handle production from the formation being tested (e.g., sweet versus sour service);

   b) a description of any previous flaring at the well, including the type of operation, flare permit approval number, and date of flare permit issue;

   c) a 1:50 000 scale topographical map showing the surface location of the well, as well as

i) clearly legible contour lines and elevations, including the contour interval number,

ii) a 7 km radius circle from the well centre, and

iii) any residences, public-use sites (e.g., community halls, campgrounds), communities, and continuous SO_2 emission sources within 7 km of the well;

d) a copy of the emergency response plan (ERP) map;

e) a description of operations to be conducted that require flaring/incineration (e.g., cleanup, work-over, and testing);

f) information on the proposed combustion device (i.e., flare or incinerator), including

i) the height and internal diameter of the proposed stack at final exit; and

ii) if an incinerator is proposed, information on the design limits and controls as follows:

- minimum and maximum design gas flow ratings (i.e., information on the design operating range of the incinerator);
- energy balance calculations to support stack exit velocity and temperature assumptions used in dispersion modelling evaluations; and
- air-fuel control system that will be used to ensure assumed stack exit conditions (i.e., temperature and velocity) are met;

g) the most recent condensate-free gas analysis from the well in question, or if a gas sample from the well in question is not available, an analysis of gas from the same pool;

h) a completed electronic copy of the flaring calculation spreadsheet in accordance with instructions in the EUB WellTest Ver 1.xls spreadsheet, including assessment of terrain and nomograph calculation sheets for parallel air flow situations;

i) information from screening, refined, or complex dispersion modelling assessments, if required, to address use of incinerators, complex terrain, or other unique conditions; flaring/incineration permit applications involving complex terrain and/or refined modelling assessments must include the following:

i) a description of the meteorological data source (location, years, and months),

ii) wind rose,

iii) a summary of the source parameters (a printed copy of the input file is preferred, as output files may be large and need not be submitted),

iv) the maximum predicted one-hour ambient air SO_2 concentration for maximum flow rate (Q_{max}), average flow rate (Q_{avg}), and one-eighth maximum flow rate (Q/8) or the minimum flow rate (Q_{min}), whichever is lower,

v) if exceedances of the one hour Alberta Ambient Air Quality Guidelines for SO_2 are predicted, a histogram as to the overall probability of exceedance based on meteorological data is to be calculated, as follows, by dividing the number of hours with predicted exceedances by the total number of hours used in the meteorological data set:

$$\text{Probability of Exceedance} = \frac{\text{(Cumulative number of hours with predicted exceedances)}}{\text{(Total hours modelled)}}$$

vi) an interpretation of the modelling results (output files or model result printouts may be included if not excessively large),

vii) histograms showing exceedances based on criteria (e.g., wind direction, wind speed, stability class etc.);

j) information on the feasibility of in-line testing (this must include the distance to the closest potential tie-in location or testing constraints if there is a pipeline connection to the well);

k) air quality management plans—applications with management plans must include sufficient information so that EUB staff can assess the plans description of the management plan, including

   i) for each flow rate, a summary table of output, including

      - meteorological conditions (stability class and range of wind speeds and directions) or times of day that result in predicted exceedance of the one-hour Alberta Ambient Air Quality Guidelines for SO_2,
      - maximum predicted SO_2 concentration for each condition where guideline exceedances are predicted, and
      - the expected overall probability of exceedances before and after implementation of the management plan;

   ii) for each flow rate, an area map showing

      - locations of predicted SO_2 ground-level concentration isopleths (with a minimum 7 km radius) in excess of the one-hour Alberta Ambient Air Quality Guidelines for SO_2,
      - sectors with flaring restrictions (if proposed),
      - locations accessible with a mobile monitoring unit (if proposed),
      - approximate location of proposed stationary monitors (if proposed) and, if available, a recent air photo showing the approximate location of proposed stationary monitors, as well as specifications of the monitor location in a format usable by the monitoring licensee (e.g., UTM coordinates, or latitude and longitude), with an acceptable offset distance if this is required to improve access or telemetry line of site; site reconnaissance should be conducted before submission to ensure that monitors can be placed, and
      - UTM coordinates of stationary monitors, as well as distance and direction from well;

   iii) a calculation of make-up fuel gas requirements as a percentage of the produced gas being combusted (fuel gas may be used to increase plume rise; care should be taken to minimise fuel gas waste); and

l) electronic copies (i.e., Microsoft Word or Excel files) of the management plan and decision tree (if applicable).

Appendix 6: Flaring/Incinerating Permit Application Form

The EUB Flaring/Incinerating Permit Application Form and instructions for its submission are available on the EUB Web site <www.eub.gov.ab.ca>. Completed forms should be transmitted via e-mail to <flaring.applications@gov.ab.ca>. A sample form is shown below for reference only.

EUB Alberta Energy and Utilities Board

Flaring/Incinerating Permit Application Form

1. APPLICANT INFORMATION	
Licensee company name	Licensee contact name
Licensee phone no.	Licensee e-mail
Consultant information *Is a consultant preparing this form on behalf of the licensee? (check one)* ☐ Yes ☐ No	
Consultant company name	Consultant contact name
Consultant phone no.	Consultant e-mail
Consultant e-mail	

2. WELL DETAILS	
Well name	Well licence no.
UWI	Surface location
Type of well *(check one)* ☐ Gas ☐ Oil	Well designation *(check one)* ☐ Critical ☐ Noncritical
Zone	Lahee classification
Well centre elevation (m)	Max. terrain elev. (7 km radius) (m)
Proposed operation end date	Stack height (m)
H_2S concentration (%)	Exit diametre (mm)
Total volume (10^3 m^3)	Total sulphur emissions (tonnes)
Maximum rate (10^3 m^3/day)	Average (expected) rate (10^3 m^3/day)
Hydrocarbon liquid production (m^3/d)	Water production (m^3/d)

Liquids from the well will be transported to:

Name of facility: Location:

Note: Produced water and hydrocarbon liquids must be transported in trucks equipped with pressurized tanksif H_2S or other odorous or potentially hazardous compounds are present.

3. ATTACHMENTS

Which of the following are attached? (check all that apply):

☐ Information on whether the well was or is tied into production facilities

☐ A description of previous flaring (including type of operation, flare permit number, and date)

☐ 1: 50,000 scale topographical map

☐ A copy of the emergency response plan (ERP) map

☐ Description of the operations to be conducted that require flaring/incineration (e.g., cleanup, work-overs, testing)

☐ Information on the proposed combustion device (i.e., flare or incinerator)

☐ The most recent condensate-free gas analysis from the well in question or, if a gas sample from the well in question is not available, an analysis of gas from the same pool

☐ A completed electronic copy of the flaring calculation spreadsheet (EUB WellTest Ver 1.xls), including assessment of terrain and nomograph calculation sheets for parallel air flow situation.

☐ A copy of screening, refined or complex dispersion modelling assessments, if required, to address use of incinerators, complex terrain, or other unique conditions

☐ Information on the feasibility of in-line testing (this must include the distance to the closest potential tie-in location or on testing constraints if a pipeline connection to the well exists.

☐ Electronic copies of the management plan and decision tree (if applicable)

Appendix 7: Application Information for Routine Flare Volume Exceedance for Well Test and Underbalanced Drilling (600, 400, or 200 10^3 m^3 Exceedance)

If flare volumes are expected to exceed the routine flare volume allowance during underbalanced drilling and well testing operations, additional information must be submitted.

1) Underbalanced drilling applications must include the following information:

   a) an explanation and supporting documentation of how flaring rates are determined; possible sources for these estimates may come from

      i) offset well AOF tests, or

      ii) flaring rates from offset underbalanced drilling operations;

   b) estimated time required to drill the well;

   c) if a well test is proposed, the total volume requested for the test.

2) For well tests that are expected to exceed the routine flare volume allowance, the application must include the following information:

   a) a brief description of the development required to bring the well onto production (e.g., length and size of pipeline to tie in well, well site facilities, compression, gas processing facilities);

   b) the minimum recoverable reserves required for the well to be economic (minimum economic reserves);

   c) details of the analysis used to determine the minimum economic reserves (licensees may use simplified "netback" economics showing the current operating profit [revenues minus operating costs] to estimate the recoverable reserves required to pay out facility investment costs; alternatively, licensees may choose to present a more detailed economic analysis involving features such as discounted gas flow projections);

   d) the estimated recovery factor and surface loss for the pool;

   e) the estimated initial reservoir pressure;

   f) the amount of reservoir depletion being targeted by the test (the licensee should provide a brief description justifying this depletion in relation to the minimum economic reserve)—the recommended maximum pressure depletion guidelines are

      i) 1% of the first 5000 kPa of reservoir pressure, and

      ii) 0.5% of the reservoir pressure above 500 kPa;

      for example, a maximum depletion guideline of 100 kPa is targeted for a reservoir with an initial pressure of 15 000 kPa;

   g) justification for pretest cleanup and servicing flaring, if related volumes exceed 200 10^3 m^3.

   Note that an incremental volume of up to 200 10^3 m^3 may be added to the permit application in order to provide for pretest cleanup and servicing operations, if these are needed to establish the minimum economic reserve without additional justification.

Appendix 8: Simplified Sour Flare Assessments for Parallel Air Flow Conditions

This procedure is only applicable to the dispersion evaluation for sour flaring events (and other flaring operations in Alberta) where *temporary* stacks are used. For the flare dispersion evaluation process at *permanent* facilities, see Section 7.15.

The nomographs and complex terrain calculations in the EUB WellTest Ver 1.xls spreadsheet are not applicable for incinerators or enclosed burners (see Section 3.5.1).

The following are EUB requirements for evaluating the potential effects of temporary and emergency flaring on ambient air quality. This procedure includes the use of nomograph calculations, complex and refined dispersion modelling, and application requirements:

1) Evaluate well test parameters using the spreadsheet EUB WellTest Ver 1.xls provided on the EUB Web site. The information required includes the following:

   a) The most recent condensate-free gas analysis from the well in question or a referenced gas sample from the same pool, if a gas sample from the well in question is not available—licensees may use a different gas composition, but must be able to justify that composition. The lower, or net, heating value of the flared gas is determined by the spreadsheet and is tracked by the EUB.

   b) If you determine that an H_2S concentration different from the analysis value is appropriate, you may use this concentration. **(Note that the selected H_2S concentration will be a maximum condition of the permit.)** Therefore, select an H_2S value that allows for the variability of available data and reasonable testing flexibility. The spreadsheet will prorate the representative H_2S to the requested maximum by rounding up to the nearest 0.5% increment.

   c) The maximum flaring rate, which will also be a limiting condition of the permit.

   d) The average flaring rate.

   e) The flare stack height and internal diameter at final exit—exit velocity is dependent on the final exit diameter; therefore, if larger-diameter flare tips are used, then this larger diameter must be considered. You are encouraged to size the exit diameter within the range of exit diameters provided in EUB WellTest Ver 1.xls.

   f) The well centre base elevation (metres)—this elevation must be input from the well licence.

   g) The total volume of raw gas to be flared.

   h) The anticipated flaring start and end dates.

2) Determine if parallel airflow nomograph calculations are applicable. The EUB WellTest Ver 1.xls spreadsheet determines a terrain template within 7 km of the flare for each specific flaring scenario. If the terrain elevations do not exceed the calculated complex terrain template, modelling for complex terrain is not required and nomograph calculations for parallel airflow in item 5 below may be used to evaluate the flare.

   a) If the terrain exceeds the complex terrain template (calculated by the EUB WellTest Ver 1.xls), modelling for complex terrain is required (see Appendix 9).

b) If continuous SO_2 emissions sources are within 7 km of the proposed flaring site, then refined dispersion modelling must be done.

3) The EUB WellTest Ver 1.xls spreadsheet must be used to evaluate the flare, even with flow rates less than 10 000 m^3. The spreadsheet produces pseudo-parameters that are used as inputs in other dispersion models.

4) The EUB spreadsheet calculates and compares the maximum allowable emission rate for compliance with the EUB low-risk criteria with the proposed design. It also evaluates minimum and maximum exit velocities with respect to down-wash criteria. The results will assist licensees in optimizing flare design and verifying parameters used for flare permit applications (Section 3.3)

5) Determine acceptable sour gas flaring parameters for parallel airflow conditions, keeping in mind the following:

a) If the maximum emission rate proposed for the flare is less than the calculated maximum allowable emission rate, modelled flaring parameters should result in acceptable predictions and no further modelling is required. (Note that there is less than a 1% chance of predicted exceedances during the month[s] that flaring is requested.)

b) If the maximum emission rate proposed for the flare is greater than the maximum allowable emission rate, flare design criteria must be modified (e.g., decrease the maximum flaring rate, increase the stack height) or refined modelling is required to assess the proposed flare in more detail.

c) If flare-tip down-wash is predicted to occur, the spreadsheet will conservatively account for down-wash; however, it is recommended that the stack design parameters (e.g., stack diameter) be modified to avoid down-wash. The spreadsheet provides maximum and minimum exit diameters based on the recommended exit velocities. You should size the exit diameter within the range of exit diameters provided in EUB WellTest Ver 1.xls. Although exit diameter is not a permitted parameter, it is recommended that a professional engineer review the flare design parameters.

6) If the results of screening calculations or the EUB WellTest Ver 1.xls spreadsheet calculations for parallel airflow situations predict unacceptable exceedances of the low-risk criteria and it is not practical to modify flare design parameters, you may consider evaluating the proposed flare design with more refined dispersion modelling approaches (see Appendix 9).

a) Results that predict an overall probability of exceedance (regardless of location) of the one-hour Alberta Ambient Air Quality Guidelines for SO_2 less than 1% of the time during the well test period will be considered low risk, provided that predicted ground-level SO_2 concentrations do not exceed 900 $\mu g/m^3$.

b) If the EUB low-risk criteria are not met, flare design parameters must be modified so that the low-risk criterion is achieved *or* a management plan (see Appendix 10) must be developed to achieve the EUB low-risk criteria.

Appendix 9: Complex Terrain and Refined Dispersion Modelling

If parallel airflow assumptions and conditions are not valid for the proposed sour well test flare, a complex terrain dispersion model assessment is required. In cases with incinerators or enclosed burners, refined dispersion modelling must be performed. Refined dispersion modelling may also be used as an alternative to methods outlined in Appendix 8, particularly if that methodology predicts unacceptable exceedances of the Alberta Ambient Air Quality Guidelines. Refined dispersion modeling is also required to assess the cumulative effects of the proposed flaring in combination with other continuous SO_2 emission sources with 7 km of the location. Modelling must be conducted by or under the supervision of someone experienced in the use of the model selected, such that the low-risk criteria are met.

1) Accepted models for complex terrain include RTDM, AERMOD, CALPUFF, ISCST3 (in complex mode), and SCREEN3 (in complex mode). Licensees are responsible for ensuring that appropriately trained and qualified personnel complete the air quality evaluations.

2) Refined modelling procedures for parallel airflow conditions are similar to the complex terrain modelling procedures; however, the model and its application should be applicable to parallel airflow conditions.

3) The following assumptions used in the EUB WellTest Ver 1.xls spreadsheet are applicable to complex terrain and refined dispersion modelling:

   a) 25% radiation heat loss;

   b) 98% molar conversion of H_2S to SO_2 (i.e., 100 moles H_2S yields 98 moles SO_2, plus 2 moles H_2S, and only 98% of available combustion energy is released as heat); and

   c) rural dispersion conditions.

4) If there is an incinerator or enclosed burner, the following assumptions shall be used:

   a) complex terrain criteria, as defined in EUB WellTest Ver 1.xls;

   b) 100% molar conversion of H_2S to SO_2; and

   c) rural dispersion conditions.

5) Modelling should consider flaring at the maximum requested flaring rate (Q_{max}), the average flaring rate (Q_{avg}), and $Q_{max}/8$ or Q_{min}, whichever is lower. Reduced flaring rates result in lower emission rates but also provide less buoyant force to the plume. In complex terrain these competing factors may lead to worse predictions for lower flaring rates. Based on EUB data, maximum flaring rates tend to be lower than requested maximum flaring rates. Also, average flaring rates are less than actual maximum flaring rates. The EUB will continue to monitor requested and actual flaring rates and will adjust the modelling procedure, if appropriate.

   a) Under parallel airflow conditions, refined modelling should use the maximum rate, Q_{max}; under complex terrain conditions, the lowest rate case, $Q_{max}/8$, should be used.

6) For models that require meteorological data, five years of meteorological data from a standard period is recommended. A minimum two months, and a maximum three months, per year should be modelled from the data set, commencing from the month the flare permit is requested. The regional data sets posted on the Alberta Environment Web site <www.gov.ab.ca/env/air/airqual/metdata.htm> may be suitable for

this. Meteorological data should be representative of expected conditions at the site. (Note that the ambient temperature in the data sets must be modified to match the pseudo-stack condition exit calculation.) Justification for the selected meteorological data must be provided with the application. Additional information about modelling and meteorological data requirements is provided on the Alberta Environment Web site.

7) Exceedances of the one-hour Alberta Ambient Air Quality Guidelines for SO_2 occurring less than 1% of the time will be considered low-risk and only applies to temporary flares. However, predicted ground-level SO_2 concentrations must not exceed 900 $\mu g/m^3$. Care must be used when calculating this probability. The overall probability is calculated by dividing the number of hours with predicted plume centreline exceedances by the total number of hours modelled based on the meteorological data set. **Applicants meeting these requirements may apply to flare with no additional restrictions.**

8) If Alberta Ambient Air Quality Guidelines exceedances are predicted and the low-risk criteria noted above are not met, flare design parameters must be modified *or* a management plan must be developed (see Appendix 10) to meet the EUB low-risk criteria and be included in the flare permit application (see Section 3.3).

9) Applicants are required to submit supporting information, including model results, input data, and assumptions, as part of the application. Dispersion modelling results must include the following:

   a) For each flow rate, an area map (with a minimum 7 km radius) showing the location of the predicted SO_2 ground-level concentration isopleths for any exceedances of the one-hour Alberta Ambient Air Quality Guidelines for SO_2 (450 $\mu g/m^3$).

   b) For each flow rate, information on the expected frequency of exceedances of 450 $\mu g/m^3$ ground-level ambient air SO_2 concentrations. For cases where management plans are used, provide expected frequency of exceedances, both without management plan *and* with management plan.

10) Licensees may submit data based on modified modelling methods for consideration; however, results from one of the accepted unmodified models must also be submitted for comparison. Description and scientific justification of the modifications must be provided. Generally, review of permit applications that use a modified modelling method requires more time, and the EUB may accept or reject the modified results at its discretion.

Appendix 10: Well Test Air Quality Management Plans

If exceedances of the low-risk criteria for SO_2 (Appendix 9) are predicted and it is not proposed to alter flare/incinerator design parameters to mitigate the potential exceedances, approval of sour gas flaring may be granted, provided that suitable control measures are in place. In such situations, an air quality management plan must be submitted with the flaring permit application. **The management plan must outline how predicted exceedances of the Alberta Ambient Air Quality Guidelines will be avoided, such that the low-risk criteria are met.**

The air quality management plan may include the following:

1) Restrictions to flaring or incinerating during specific meteorological conditions that will limit or avoid operations under conditions that result in predicted exceedances.

   a) These atmospheric conditions may include

      i) time of day

      ii) wind direction

      iii) wind velocity

      iv) atmospheric stability

   b) Meteorological monitoring may be used as a management plan based on a maximum 1-hour average (i.e., any consecutive 60 minutes), with measurements taken at a frequency of no greater than every 15 minutes (i.e., four measurements/hour).

2) Restrictions that may be applied during unfavourable meteorological conditions.

   a) Operational restrictions in air quality management plans may include

      i) suspension of flaring or incineration operations

      ii) reduction of flaring or incineration rates

      iii) requirements for supplemental fuel gas

   b) If a reduction in flaring or incineration rate or an addition of supplemental fuel gas is proposed, compliance with the EUB low-risk criteria must be demonstrated with appropriate dispersion modelling results. (Note that reduced flaring or incineration rates do not result in a proportional reduction in predicted concentrations.)

   c) The management plan must include specifications for locating meteorological monitoring equipment (if used) and must demonstrate that the meteorological data will be representative of the conditions at stack height. **Wind monitoring devices must be elevated above the height of trees surrounding the site**.

3) Ambient air monitoring (mobile and/or stationary) must be located where exceedances of the Alberta Ambient Air Quality Guidelines are predicted.

a) Ambient air monitoring in conjunction with appropriate flare management procedures will only be accepted when it can be demonstrated that monitors can be placed in a manner that is reasonably protective of all locations where exceedances of the EUB low-risk criteria are predicted. Presently stationary monitors are accepted to cover an arc of 22.5°C centred on the flare. Licensees must provide a map of the area (1:50 000) indicating the location(s) of the stationary monitor(s). In cases where monitoring is proposed, licensees must demonstrate that there is good access to all areas with predicted exceedances *before* a flaring application is submitted.

b) Ambient air monitoring must occur at intervals of 15-minutes or less. **A maximum of two consecutive observed exceedances of the Alberta Ambient Air Quality Guidelines must result in the immediate shutting in of flaring operations**. Flaring may recommence after a 1-hour period or after meteorological conditions change and remain in a favourable sector for 30 minutes, whichever is longer.

4) Where there is more than one meteorological condition that requires a management response, or where a combination of meteorological restrictions and ambient air monitoring is proposed, the management plan must be summarized in a flowchart that is clear and concise and can be applied by on-site staff during flaring operations. Furthermore, if multiple flow rates are proposed in the management plan the EUB low-risk criteria must be met for each flow rate.

a) The management plan must clearly specify the frequency at which the meteorological or ambient air quality monitoring data will be monitored by on-site staff. An averaging time of no greater than 15 minutes is mandatory, as this allows for observations of trends and provides adequate time to respond to elevated concentrations.

5) The management plan must clearly define under what conditions flaring may resume if suspended or return to normal operations if a management option such as fuel gas is proposed. The EUB requires flaring to remain suspended for at least 1-hour before operations may resume, in order to prevent an exceedance or to respond to an exceedance.

Appendix 11: EUB Flaring/Incinerating/Venting Notice Form

Licensees are requested to complete the on-line EUB Flaring/Incinerating/Venting Notice Form using the EUB's Field Information System (FIS) and submit it electronically to the local EUB Field Centre. This form is available at <www.eub.gov.ab.ca/BBS/dds/dds/dds.htm>.

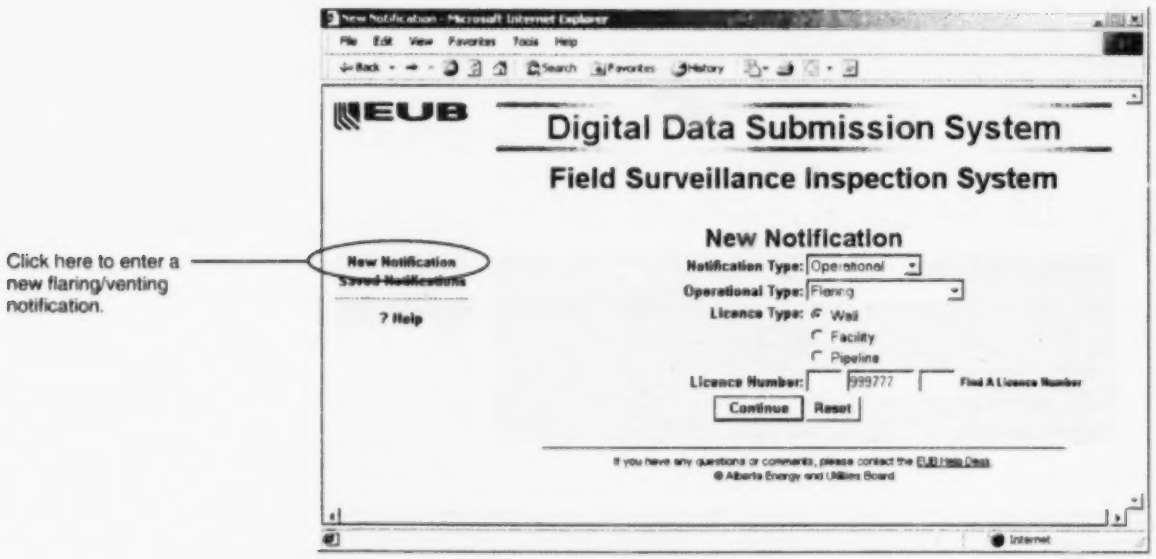
Note that any operations that may result in public complaints must be called in to the EUB Field Centre 24-hour emergency phone number.

FIS Flaring/Incinerating/Venting Notification Procedure

The following is from the FISWebGuide (pages 31-34).

Add a flaring/venting notification

1. To enter a new flaring or venting notification, click **New Notification** in the main FIS window.



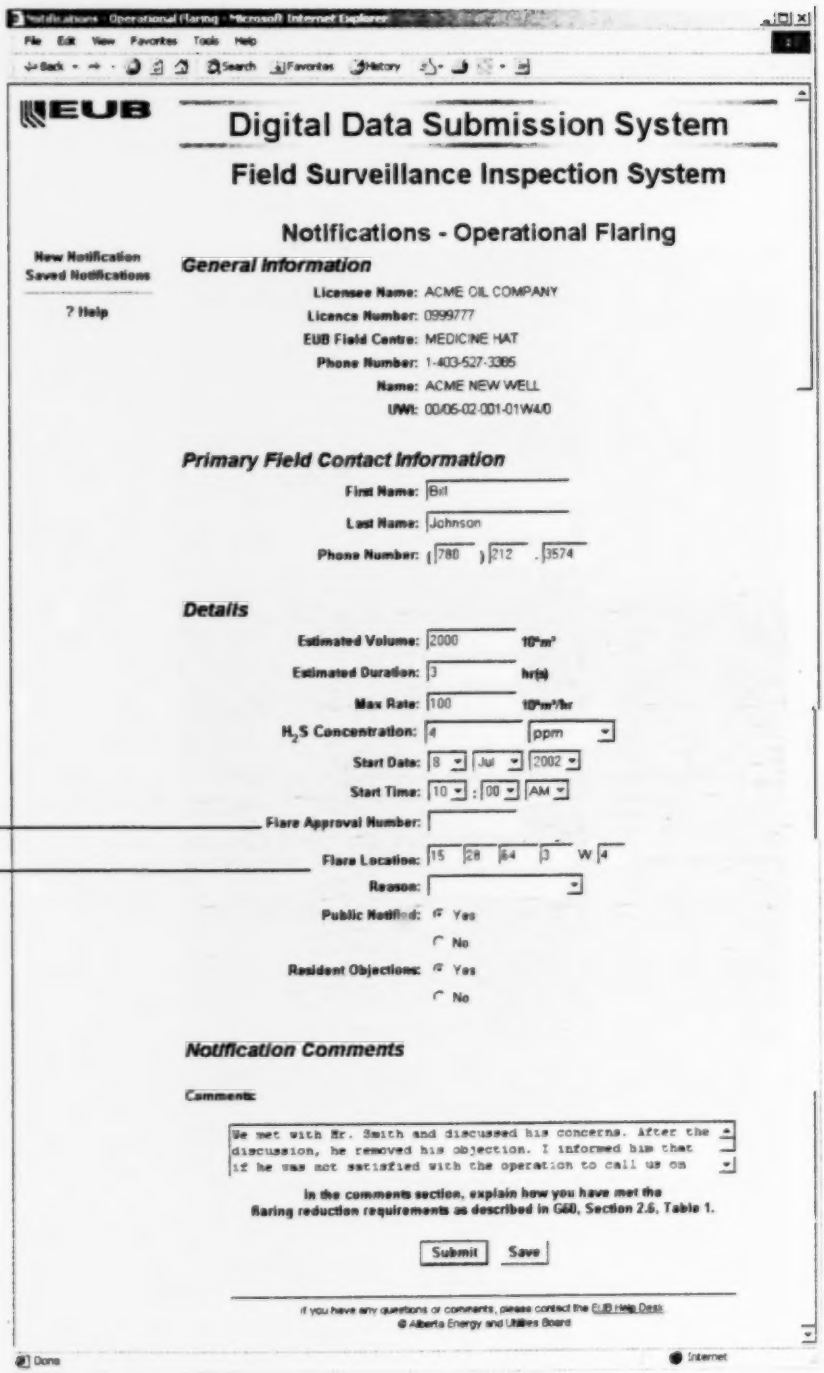
2. Select Operational from the Notification Type drop-down list.

3. Select Flaring or Venting from the Operational Type drop-down list.

4. Enter the well Licence Number that the new notification applies to. This is a required field.

5. Click **Continue** to open the Notifications – Flaring/Venting fields.

This example is for a well.


Notifications - Operational Flaring - Microsoft Internet Explorer
File Edit View Favorites Tools Help
EUB
Digital Data Submission System
Field Surveillance Inspection System
Notifications - Operational Flaring
New Notification
Saved Notifications
? Help
General Information
Licensee Name: ACME OIL COMPANY
Licence Number: 0999777
EUB Field Centre: MEDICINE HAT
Phone Number: 1-403-527-3385
Name: ACME NEW WELL
UWI: 00/06-02-001-01W4/0
Primary Field Contact Information
First Name: Bill
Last Name: Johnson
Phone Number: (780) 212 - 3574
Details
Estimated Volume: 2000 10³m³
Estimated Duration: 3 hr(s)
Max Rate: 100 10³m³/hr
H2S Concentration: 4 ppm
Start Date: 8 Jul 2002
Start Time: 10 : 00 AM
Flare Approval Number:
Flare Location: 15 28 64 3 W 4
Reason:
Public Notified: Yes No
Resident Objections: Yes No
Notification Comments
Comments:
We met with Mr. Smith and discussed his concerns. After the discussion, he removed his objection. I informed him that if he was not satisfied with the operation to call us on
In the comments section, explain how you have met the flaring reduction requirements as described in G60, Section 2.6, Table 1.
Submit
Save
If you have any questions or comments, please contact the EUB Help Desk
© Alberta Energy and Utilities Board
Done
Internet

Flare Approval Number applies only to flaring.

Flare Location is named Vent Location when entering venting notifications.

6. Enter the following flaring/venting notification information.

Notifications are time/date stamped when they are submitted to the EUB. As time deadlines are an important part of the notification process, please submit accurate notification information on a timely basis to avoid enforcement action.

Field	Description
Primary Field Contact Information	
First Name	Enter the first name of the primary contact person to contact about the flaring or venting activity.
Last Name	Enter the last name of the primary contact person to contact about the flaring or venting activity. The contact should be based in the field.
Phone Number	Enter the 10-digit phone number of the primary contact person.
Details	
Estimated Volume	Enter the estimated flare or vent volume in 10^3 m^3. **(Required)**
Estimated Duration	Enter the estimated duration of the flaring or venting in hours. **(Required)**
Max. Rate	Enter the estimated maximum rate flaring or venting in 10^3 m^3/hour. **(Required)**
H_2S Concentration	Enter the flaring, incinerating, and venting emission H_2S concentration and select the unit of measurement. Options are mol/kmol, ppm (parts per million), and per cent. (If ppm or per cent are entered, FIS automatically converts to mol/kmol, the unit of measurement in the FIS database.) **Note: (1)** If a venting notification has an H_2S concentration greater than zero, you are asked to confirm that H_2S will be in the vented gas. If so, you must contact the EUB field centre. (2) A message is also automatically sent to the field centre indicating that a sour gas venting notification was received with the licence number and date. **(Required)**
Start Date	Enter the start date of the flaring or venting. The default is the current system date. Use the drop-down list beside each field to select the day, month, and year in the first row. **(Required)**
Start Time	Enter the start time of the flaring or venting. The default is the current system time. Use the drop-down list beside each field to select the hour, minutes, and AM/PM time. **(Required)**
Flare Approval Number	Enter a flare approval number if required by *Guide 60*.
Conserving Battery	If the facility type for a flaring or venting event is Battery, this field is automatically enabled. Select Yes to show gas is normally conserved and sold instead of being vented or flared. Select No to show that gas is not normally gathered and conserved at the battery.

Conversions
ppm x .001 = mol/kmol
ppb x .000001 = mol/kmol
% x 10 = mol/kmol

Flare approval numbers apply only to flaring notifications

<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td>Flare/Vent Location</td><td>
<table>
<tr><th>Licence</th><th>Location</th></tr>
<tr><td>Well</td><td>The surface location is automatically entered for well licences. This can be modified if required.</td></tr>
<tr><td>Facility</td><td>The LSD, section, township, range, and meridian are automatically shown for facilities. This may be modified if required.</td></tr>
<tr><td>Pipeline</td><td>Enter the exact location of the flaring or venting.</td></tr>
</table>
<table>
<tr><th>Field</th><th>Valid Values</th></tr>
<tr><td>LSD</td><td>01-16
LSD required if Township entered</td></tr>
<tr><td>Section</td><td>01-36
Required if Township entered</td></tr>
<tr><td>Township</td><td>001-126
Required if Meridian entered</td></tr>
<tr><td>Range</td><td>1-30 for W4 &W5
1-14 for W6
Required if Township entered</td></tr>
<tr><td>Meridian</td><td>W4, W5, W6
Required if Township entered</td></tr>
</table>
Required
</td></tr>
<tr><td>Reason</td><td>Select the reason for the flaring or venting from the drop-down list. Options are Emergency, Planned Maintenance, Test, and Unplanned Maintenance.
Required</td></tr>
<tr><td>Public Notified</td><td>Select No to show that the public has not been notified of the flaring or venting operation. This is the default and you must explain how you have met flaring notification requirements on the Notification Comments tab.

Select Yes to show that the public has been notified of the flaring or venting.</td></tr>
<tr><td>Resident Objections</td><td>Select Yes to show that there are resident objections to the flaring or venting operation. This is the default and you must explain the objection(s) and the appropriate solution on the Notifications Comments tab. If no solution was agreed to, explain the outcome of the objection (for example, hearing).

Select No to show that there were no objections to the flaring or venting.</td></tr>
<tr><td>Notification Comments</td><td>Explain how you have met the flaring reduction requirements for flaring/venting of gas from conserving facilities (Guide 60, Table 1), or enter comments about public notifications/ objections.</td></tr>
</table>

Please include as much information as possible in the Comments field. Include a secondary contact where possible.

7. Click **Submit** to submit the flaring or venting notification for validation. If errors are found, you are prompted to correct them.

   A DDS acknowledgement is shown on the terminal and e-mailed to the contact if requested for the DDS Login ID.

Appendix 12: Sour Gas Flaring/Incinerating Data Summary Report

The Sour Gas Flaring/Incinerating Data Summar Report form must be completed in full and submitted to the EUB's Compliance and Operations Branch within three weeks of the flaring completion date. Send to

Flaring Permits, Compliance and Operations Branch
Alberta Energy and Utilities Board
640 – 5 Avenue SW, 12th Floor
Calgary, AB T2P 3G4
Fax: (403) 297-2691

EUB Alberta Energy and Utilities Board **Sour Gas Flaring/Incinerating Data Summary Report**

1. GENERAL INFORMATION			
Company Name:		Company Contact:	
Phone/Fax Number:		E-mail:	
Permit No:		Permit Issue Date:	
Well Name:		Unique Well Identifier:	
2. NOTIFICATION DETAILS			
EUB Field Centre Contact:		Notification Date:	
3. FLARING/INCINERATING DETAILS			
Volume of Raw Gas Flared (10^3 m^3):	Approved	Actual	
Raw Gas Flow Rate (10^3 m^3/d)	Approved (Max.)	Actual (Max.)	Actual (Avg.)
Actual Net Heating Value of Raw Gas:			
Actual Fuel Gas Flared (if applicable):	Volume (10^3 m^3)	Rate (10^3 m^3/d)	
Number of H_2S Analyses Conducted:			
H_2S Content of Raw Gas (%):	Approved (Max.)	Actual (Max.)	Actual (Avg.)
Total Sulphur Flared (tonnes) = 1.35592 (%H_2S÷100) (flared vol.)			
Flaring Dates:			
Air Monitoring Conducted: ☐ Yes ☐ No (If Yes, attach monitoring report)			
Exceedances of the Alberta Ambient Air Quality Guidelines (H_2S or SO_2): ☐ Yes ☐ No			
Comments:			

Appendix 13: Application to Extinguish Sour Gas Flare Pilots

The following minimum requirements must be met in any situation where it is proposed to extinguish a flare pilot at a sour facility:

1) The maximum stabilized wellhead pressure must be determined based on the measured stabilized static wellhead pressure corrected for the hydrostatic head of any liquid present in the wellbore at the time of testing.

   a) This correction for the liquid column hydrostatic head must use the density of the produced water for the entire fluid column present in the wellbore.

   b) The maximum stabilized static wellhead pressure must be determined by a qualified well test professional using accepted engineering practices. EUB *Guide 40* provides regulations for conducting pressure tests on wells.

2) The following features must be incorporated into the facility in order for approval of extinguishing the flare pilot:

   a) Nonfragmenting rupture disks must be installed on the upstream side of all pressure safety valves (PSVs). The modified facilities must meet requirements of the Alberta Safety Codes Act.[1]

   b) A pressure gauge or suitable telltale indicator must be installed between each rupture disk and the corresponding PSV to allow detection of leakage or a disk rupture.

   c) Two block valves in series must be installed for manual depressurizing valves connected to the flare.

   d) The battery must be equipped with a pressure sensor, automatic emergency shutdown valves (ESDVs), and a control system configured to isolate the battery from the well and outlet gas pipeline. There must be no automatically controlled emergency depressurizing valves connected to the flare.

3) Upstream piping to the well must be designed for the maximum pressures that might be encountered. The *minimum* operating requirements for any facility approved for extinguishing flare pilots include the following:

   a) Licensees must monitor and document on a weekly basis the pressure between rupture disks and PSVs.

   b) If a rupture disk fails or if odours result from gas released to the flare stack, the flare stack must be lit and immediate notification must be given to the EUB Field Centre, followed by a written incident report giving particulars. Approval to extinguish the flare pilot is then considered void until the licensee demonstrates to the satisfaction of the EUB Field Centre that related problems have been successfully corrected.

   c) The sweet gas or propane pilot must be ignited prior to any flaring or depressurizing at the site.

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[1] *AR 293/94 Boilers and Pressure Vessels*, Alberta Safety Code Act, Alberta Boilers Safety Association, consolidated to 2001.

d) The operation of the emergency shutdown system, including ESDVs, must be verified and documented at minimum on an annual basis.

e) EUB approval to extinguish the flare pilot must be visibly displayed at each site.

4) Residents within the emergency planning zone (EPZ) must be notified of plans to extinguish the flare pilot.

a) Any concerns or objections of residents to extinguishing pilots must be addressed. Refer to the dispute resolution process discussed in Section 2.9 for guidance.

5) The following information must accompany the licensee's application to extinguish flare pilots:

a) a list of all wells connected to the battery, including

i) normal wellhead operating pressure, and

ii) maximum stabilized static wellhead pressure;

b) the maximum design operating pressure of the piping and pressure vessel systems for the battery, including

i) a list of all PSVs connected to the flare and related release set-pressures, and

ii) a list of related rupture disks and burst pressures;

c) written confirmation that

i) none of the wells connected to the facility is completed in pools that have active injection or cycling schemes,

ii) rupture disks on PSVs and two valves in series have been installed on all streams tied into the flare system,

iii) maximum H_2S release rates will not exceed level-1 or -2 sour well classification,

iv) residents within the EPZ have been provided notification, and

v) high-pressure shutdowns are in place, with a statement confirming calibration frequency.

Appendix 14: H_2S Odour Management Process

The following is from *Guide 64*, Appendix 12. See also *Guide 60*, Section 8.4: Fugitive Emission Management.

Purpose: To clarify off-site regulatory requirements for H_2S odour management.

For facilities ≥ 10 mol/kmol (1% H_2S), if an inspector or an air-monitoring unit detects H_2S odours off lease:

Off-site inspection/monitor results	Odour complaint/facility history	Action
Inspector/air monitor validates odours off lease.		• Licensee must control emissions immediately or suspend facility/operation until repairs can be made. • Licensee will be placed on EUB's Enforcement Ladder as a major noncompliance.

For facilities < 10 mol/kmol (1% H_2S), if an inspector or an air-monitoring unit detects H_2S odours off lease:

Off-site inspection/monitor results	Odour complaint/facility history	Action
Inspector/air monitor validates odours off lease.	• No complaint. • No complaint history (no odour complaints within last 12 months).	• Licensee must equip facility to control emissions within 30 days. • Failure to comply will result in suspension and major noncompliance.
	Complaint received within 30 days of first inspection date.	• Licensee must control emissions immediately or suspend facility/operation until repairs can be made. • Failure to comply will result in suspension and major noncompliance.
Inspector/air monitor validates odours off lease.	Initial (first) complaint.	• Licensee must control emissions immediately or suspend facility/operation until repairs can be made. • Failure to comply will result in suspension and major noncompliance.
	• Complaint received (documented complaint history on facility/ operation). • Previous odour mitigation requested by EUB.	• Licensee must suspend facility. • Licensee will be placed on EUB's Enforcement Ladder as a major noncompliance.

Trucking Operations

For facilities ≥ 10 mol/kmol (1% H_2S)

Off-site inspection/monitor results	Odour complaint/facility history	Action
Inspector/air monitor validates odours off lease.		• Licensee where product originated may be requested to suspend facility. • Licensee must suspend trucking operations until product can be transported without releasing any H_2S. • Licensee will be placed on EUB's Enforcement Ladder as a major noncompliance.

For facilities < 10 mol/kmol (1% H_2S):

Off-site inspection/monitor results	Odour complaint/facility history	Action
Inspector/air monitor validates odours off lease.	Initial (first) complaint.	• Licensee must suspend trucking operations until product can be transported without releasing any H_2S. • Failure to comply will result in suspension of facility and licensee will be placed on EUB's enforcement ladder as a major noncompliance.
Inspector/air monitor validates odours off lease.	• Documented complaint history on facility/trucking operation. • Previous odour mitigation requested by EUB.	• Licensee may suspend facility. • Licensee must suspend trucking operations until product can be transported without releasing any H_2S. • Licensee will be placed on EUB's Enforcement Ladder as a major noncompliance.